Childhood Cancer in the Northern Plains States, 2001-2005

A Four-State Collaborative Report

of

The Montana Central Tumor Registry

The North Dakota Cancer Registry

The South Dakota Cancer Registry

The Wyoming Cancer Surveillance Program

December 2008

MONTANA
Department of Public Health & Human Services

NORTH DAKOTA
DEPARTMENT of HEALTH

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The Montana Central Tumor Registry
Department of Public Health and Human Services
PO Box 202952
Helena, MT 59620
www.cancer.mt.gov

The North Dakota Cancer Registry
North Dakota Department of Health
600 E. Boulevard Ave., Dept. 301
Bismarck, N.D. 58505-0200
www.ndhealth.gov/cancerregistry

The South Dakota Cancer Registry
South Dakota Department of Health
615 E 4th Street
Pierre, SD 57501-1700
www.doh.sd.gov/SDCR/

The Wyoming Cancer Surveillance Program
Wyoming Department of Health
6101 Yellowstone Rd., Suite 259A
Cheyenne, WY 82002
wdh.state.wy.us/wcsp/index.asp

December 2008

Report prepared by
Carol Ballew, PhD
The Montana Central Tumor Registry

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This report was produced by the staff of the following programs:

The Montana Central Tumor Registry, Montana Department of Public Health and Human Services
Debbi Lemons, RHIA, CTR, Program Manager
Carol Ballew, PhD, Epidemiologist

The North Dakota Cancer Registry, North Dakota Department of Health
Marlys Knell, CTR, Program Director
Kenneth Hill, MS, Data Administrator/Analyst

The South Dakota Cancer Registry, South Dakota Department of Health
Kay Dosch, CTR, Cancer Registry Coordinator
Mary Sarvis, Data Manager
Norma Schmidt, MA, Chronic Disease Team Leader
Jacy Clarke, MPH, Chronic Disease Epidemiologist
Linda Ahrendt, Office of Health Promotion Administrator

The Wyoming Cancer Surveillance Program, Wyoming Department of Health
Julia Espinoza, BS, RHIT, CTR, Program Manager
Joe Grandpre, PhD, MPH, Deputy State Epidemiologist

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EXECUTIVE SUMMARY

This is a collaborative report by the cancer programs of Montana, North Dakota, South Dakota, and Wyoming, collectively called the Northern Plains states in this report. Each state has fewer than a million residents and correspondingly small numbers of childhood cancer cases. Aggregating data across four states, and for the five-year interval 2001-2005, improves statistical reliability and allows more rigorous comparison with national rates than is possible for each state considered individually.

Childhood cancer (diagnosis before the age of 20 years) is rare. The childhood cancer picture for the Northern Plains states is similar to that of the United States as a whole:

- Childhood cancer accounts for less than 1% of all cancer diagnoses.
- The incidence of childhood cancer of all types is 16.7/100,000 in both the Northern Plains states and the United States.
- Mortality from childhood cancer is 2.5/100,000 in the Northern Plains states and 2.8/100,000 in the United States.
- The most common childhood cancers are leukemias, followed by tumors of the brain and central nervous system, and lymphomas.

A few cancers are more common in children than adults; many have a strong genetic component in their etiology. The role of prenatal and early childhood exposure to carcinogens is less well documented, although there are notable examples of prenatal carcinogenesis, such as exposure to x-rays or diethylstilbesterol (DES). As cancers resulting from these catastrophic exposures are discovered, future exposures can be prevented, but these instances are rare. On the whole, the cause of any individual case of childhood cancer, like any individual case of adult cancer, is unknown and probably unknowable, making the prevention of childhood cancer problematic.

The primary line of defense against childhood cancer is prompt referral to a pediatric oncology specialty center as soon as cancer is suspected. The Northern Plains states, because of their small numbers of childhood cancer cases, have few pediatric specialty centers so children must usually be referred out of state for diagnosis and treatment. This ensures that children receive the best possible care, although it imposes an extra burden on families. In some cases, children may return home for follow-up treatment in their own communities under the direction of their specialty team.

Survival after childhood cancer is improving dramatically: 80% of children survive at least five years beyond their diagnosis and there are approximately a quarter of a million survivors of childhood cancer in the United States today. These survivors continue to need specialized care and follow-up.

This document is not intended to be a comprehensive treatise on childhood cancer. The interested reader is referred to *Cancer Incidence and Survival among Children and Adolescents: United States SEER Program 1975-1995*, published by the National Cancer Institute in 1999.[1]

[1] Ries LAG, Smith MA, Gurney JG, Linet M, Tamra T, Young JL, Bunin GR (eds). *Cancer Incidence and Survival among Children and Adolescents: United States SEER Program 1975-1995*, National Cancer Institute, SEER Program. NIH Pub. No. 99-4649. Bethesda, MD, 1999. available online at http://seer.cancer.gov/publications/childhood/

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INTRODUCTION

Cancer is a general term for cells that grow out of control, no longer perform their usual functions, and invade other parts of the body. Childhood cancers are classified by histology (types of cells affected and the way the cells behave) and site (part of the body), using the International Classification of Childhood Cancer (Appendix 2).[1] This differs from the system used to classify adult cancers.

As a broad category of disease, cancer is common among adults past middle age: one in three adults in the United States will be diagnosed with cancer in his or her lifetime.[2] Childhood cancers account for only approximately 1% of all cancers diagnosed in the United States each year.[3] Most kinds of cancer are rare in children, but a few are actually more common among children or teens than among adults: retinoblastoma, neuroblastoma, acute lymphoblastic leukemia, and some malignant bone cancers and soft tissue sarcomas.[4]

The fundamental process of cancer initiation is a mutation in the genetic material (DNA) of cells that regulates their function and growth. Most cells in the body constantly grow and divide, making copies of their DNA, a process that has an inherent risk of error. The risk of error increases as people age and the cells of the body are less able to repair themselves. Some risk factors increase the chance of a copying error at cell division or cause damage (mutation) to the DNA of mature cells. However, many damaged cells die spontaneously and cells have great capacity to repair their DNA, so most damaged cells do not become cancerous. Cancer in adults develops over many years, as the result of the cumulative actions of multiple risk factors and exposures.

Childhood cancer is therefore perplexing. Some childhood cancers have a strong genetic component, ranging from single-gene mutations to major chromosomal anomalies.[5] A number of recognized genetic syndromes are associated with substantially increased risks of developing specific types of childhood cancer, but genetic syndromes account for a small proportion of cases. In the absence of a gene or syndrome, family history is also a risk factor for some childhood cancers, although the exact nature of the increased risk is unknown.

Therapeutic radiation and chemotherapy for a previous primary cancer are associated with increased risk of developing some childhood cancers. In the past, prenatal exposure to therapeutic or diagnostic x-rays was also a risk factor, but prenatal exposure is rare today.[6]

There have been many investigations of parents' occupational or other exposures as risk factors for childhood cancers, and many investigations of childhood environmental exposures.

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[1] Birch JM, Marsden HB. 1987. A classification scheme for childhood cancer. *Int J Cancer* 40:620-624; Kramarova E, Stiller CA, 1996, The International Classification of Childhood Cancer, *Int JCancer*. 68:759-765; Steliarova- Foucher et al., 2005. International Classification of Childhood Cancer, Third Edition. *Cancer* 103:1457-1467.

[2] U.S. Cancer Statistics Working Group. *United States Cancer Statistics: 2004 Incidence and Mortality*. Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention *and* National Cancer Institute; 2007.

[3] National Cancer Institute http://seer.cancer.gov/statfacts/html/all.html/

[4] Ries LAG, Smith MA, Gurney JG, Linet M, Tamra T, Young JL, Bunin GR (eds). *Cancer Incidence and Survival Among Children and Adolescents: United States. SEER Program 1975-1995*, National Cancer Institute, SEER Program. NIH Pub. No. 99-4649. Bethesda, MD, 1999. Available online at http://seer.cancer.gov/publiations/childhood/

[5] Ross JA, Spector LG. Cancers in Children. In: Schottenfeld D, Fraumeni JF Jr., eds. *Cancer: Epidemiology and Prevention*, 3rd ed. New York: Oxford University Press, 2006, pp. 1251-1268; Strahm B, Malkin D. 2006. Hereditary cancer predisposition in children: genetic basis and clinical implications. *Int J Cancer* 119:2001-2006; Plon SE, Nathanson K. 2005. Inherited susceptibility for pediatric cancer. *Cancer J* 11:255-267.

[6] Wakeford R, Little MP. 2003. Risk coefficients for childhood cancer after intrauterine irradiation: a review. *Int J Radiat Biol* 79:293-309.

These studies are difficult because childhood cancers are rare and each type of cancer must be investigated individually. Another difficulty in conducting studies of risk factors for childhood cancer is the problem of assessing exposures accurately. Studies usually rely on parents' job titles or job descriptions as proxy measures for possible exposure to occupational hazards such as chemicals.[7] Studies of children's exposures to environmental factors such as agricultural chemicals or electromagnetic fields usually rely on proxy measures such as residence on a farm or near a power station.[8] These are imprecise measures of actual exposure. Many of the studies suffer from a variety of other methodological weaknesses as well.[9]

If there were real but small risks associated with these exposures, imprecise measures of exposure combined with small numbers of cases would make it nearly impossible to detect them.[10] If there were strong risks associated with these exposures, even small studies using proxy measures should detect them and there should be consistency among several studies. This is not the case. For each study that has found a possible risk factor associated with a particular kind of childhood cancer, there have been several other studies that failed to support those findings.[11] This could mean that suspected risk factors do not increase the risk of childhood cancer, or it could mean that there may be true but very small increases in risk.[12]

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[7] Colt JS, Blair A. 1998. Parental occupational exposures and risk of childhood cancer. *Environ Health Perspect* 106 (Suppl 3):909-925; Savitz DA, Chen JH. 1990. Parental occupation and childhood cancer: review of epidemiologic studies. *Environ Health Perspect* 88:325-337.

[8] Infante-Rivard C, Weichenthal S. 2007. Pesticides and childhood cancer: an update of Zahm and Ward's 1998 review. *J Toxicol Environ Health B Crit Rev* 10:81-99; Nasterlack M. 2007. Pesticides and childhood cancer: an update. 2007. *Int J Hyg Environ Health* 210:645-657; Ahlbom IC et al. 2001. Review of the epidemiologic literature on EMF and health. *Environ Health Perspect* 109 (Suppl 6):911-933.

[9] Stiller CA. 2004. Epidemiology and genetics of childhood cancer. *Oncogene* 23:6429-6444; Ahlbom IC et al. 2001. Review of the epidemiologic literature on EMF and health. *Environ Health Perspect* 109 (Suppl 6):911-933; Infante-Rivard C, Weichenthal S. 2007. Pesticides and childhood cancer: an update of Zahm and Ward's 1998 review. *J Toxicol Environ Health B Crit Rev* 10:81-99; Colt JS, Blair A. 1998. Parental occupational exposures and risk of childhood cancer. *Environ Health Perspect* 106 (Suppl 3):909-925.

[10] MacMahon B and Trichopoulus D. 1996. *Epidemiology. Principles and Methods*,2nd ed. New York: Lippincott Williams and Wilkins.

[11] Schuz J.. 2007. Implications from epidemiologic studies on magnetic fields and the risk of childhood leukemia on protection guidelines. *Health Phys* 92:642-648; McKinney PA and UK Childhood Cancer Study Investigators. 2003. Parental occupation at periconception: findings trom the United Kingdom Childhood Cancer Study. *Occup Environ Med* 60:901-909; Savitz DA, Chen JH. 1990. Parental occupation and childhood cancer: review of epidemiologic studies. *Environ Health Perspect* 88:325-337; Arundel SE, Kinnier-Wilson LM. 1986. Parental occupations and cancer: A review of the literature. *J Epidemiol Community Health* 40:30-36.

[12] Nasterlack M. 2007. Pesticides and childhood cancer: an update. *Int J Hyg Environ Health* 210:645-657; Otto M, von Mulendahl KE. 2007. Electromagnetic fields (EMF): do they play a role in children's environmental health (CEH)? *Int J Hyg Environ Health* 210:635-644.

STANDARD OF CARE FOR CHILDHOOD CANCER PATIENTS

The standard of care for children with cancer is treatment at an accredited cancer center that specializes in the diagnosis and treatment of childhood cancer. The American Academy of Pediatrics and the American Society of Pediatric Hematology/Oncology have established guidelines and standardized requirements for programs treating children with cancer.[13] In addition, the National Cancer Institute has created the Children's Oncology Group (COG), combining member institutions of the former Children's Cancer Group and the Pediatric Oncology Group, creating a network of children's cancer centers that meet strict quality assurance standards. COG centers are associated with children's hospitals, university medical centers, or both.

Accredited children's cancer centers are staffed by pediatric oncologists and a large team of other board-certified specialists with pediatric expertise, including surgeons, radiation oncologists, oncology nurses, psychologists, rehabilitation therapists, and physical therapists. There are also team members who provide support for families. In addition to providing access to a large staff of experts in childhood cancer, COG specialty centers offer access to state-of-the-art therapies and clinical trials.

Today, more than 90% of children with cancer in the United States are treated at accredited pediatric specialty facilities. This specialized, comprehensive, and multidisciplinary treatment has resulted in improved survival and quality of life for childhood cancer patients.

States with small populations such as Montana (944,632),[14] North Dakota (635,867),[15] South Dakota (781,919),[16] and Wyoming (515,004)[17] have correspondingly small numbers of childhood cancers: an average of 45, 33, 31, and 20 newly diagnosed cases per year, respectively. These numbers do not support pediatric cancer centers in each state, so children in the Northern Plains states are usually referred to one of several centers in major cities in surrounding states. This ensures that the children will receive the best possible care, but increases the burden for families caring for children with cancer.

Guidance to cancer resources in each state is available through the respective websites:

Montana: www.cancer.mt.gov
North Dakota: www.ndhealth.gov/cancer/
South Dakota: www.cancersd.com/
Wyoming: wdh.state.wy.us/phsd/ccc/cancerkits.html

[13] http://aappolicy.aappublications.org/cgi/content/full/pediatrics;113/6/1833; http://www.aspho.org/i4a/pages/index.cfm?pageid=1
[14] http://quickfacts.census.gov/qfd/states/30000.html
[15] http://quickfacts.census.gov/qfd/states/38000.html
[16] http://quickfacts.census.gov/qfd/states/46000.html
[17] http://quickfacts.census.gov/qfd/states/56000.html

CHILDHOOD CANCER SURVIVORS

The diagnosis and treatment of childhood cancers continue to improve rapidly. Today 80% of children with cancer in the United States will survive for five or more years after their diagnosis, compared to 60% in 1975.[18] The National Cancer Institute estimates that there are more than a quarter of a million cancer survivors in the United States who were first diagnosed before the age of 20 years.[18]

Cancer treatments affect children differently than adults and the late effects of treatment (long term side effects) are different as well.[19] Children's physical and cognitive growth and development may be adversely affected by their treatment. Children, like adults, may suffer from anxiety, depression, and other psychosocial effects of their cancer experience. A minority of childhood cancer survivors may experience chronic health problems as a result of their treatment; radiation and chemotherapeutic agents in particular may have secondary effects on many organ systems.

The Childhood Cancer Survivor Study began in 1993, enrolling 14,000 childhood cancer survivors diagnosed between 1970 and 1986. Because cancer treatment and survival are evolving rapidly, a second wave of enrolment began in 2007, for 14,000 additional patients diagnosed between 1987 and 1999. This multi-center investigation is beginning to document the late effects of treatment for childhood cancer survivors.[20]

Children who have completed treatment for their primary cancer continue to need the support of a multidisciplinary team of pediatric medical and social services experts. They may receive this support through their primary pediatric cancer specialty center, through a specialized long-term follow-up care team, or from community providers in collaboration with the pediatric cancer specialty team.[21]

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[18] http://www.cancer.gov/cancertopics/coping/ccss

[19] http://www.cancer.gov/cancertopics/pdq/treatment/lateeffects

[20] The Childhood Cancer Survivor Study website: http://www.stjude.org/stjude/v/index.jsp?vgnextoid=2c1325ca7e883110VgnVCM1000001e0215acRCRD

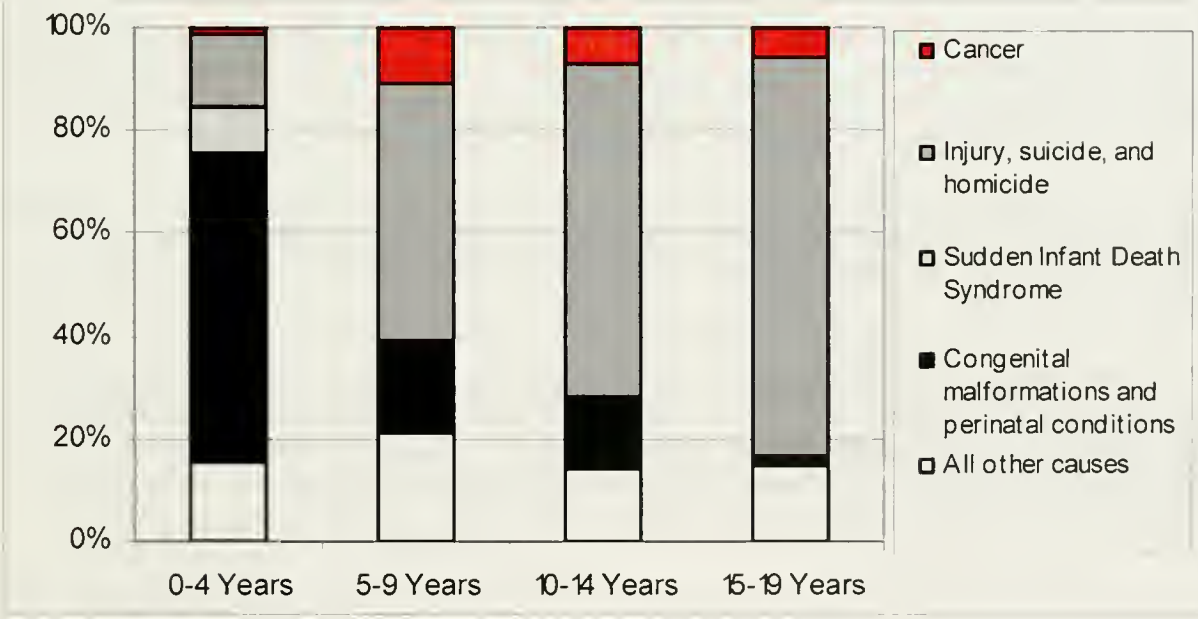
[21] *Establishing and Enhancing Services for Childhood Cancer Survivors: Long-Term Follow-Up Program Resource Guide*. Children's Oncology Group Nursing Discipline Clinical Practice Subsubcommittee/Survivorship in collaboration with the Late Effects Committee. 2007. Children's Oncology Group. The Children's Oncology Group grants permission to download *Establishing and Enhancing Services for Childhood Cancer Survivors: Long-Term Follow-Up Program Resource Guide* (including associated Appendices) from www.childrensoncologygroup.org or www.survivorshipguidelines.org and to print copies for individual and institutional use, as long as the following conditions are met: (1) Copies are not sold or distributed for commercial advantage, and (2) the Children's Oncology Group copyright and its date appear on the printed copies.

CHILDHOOD CANCER IN PERSEPCTIVE

Childhood cancers are rare and account for a small proportion of infant and childhood morbidity and mortality. Fewer than 15,000 new cases of cancer are diagnosed in children under the age of 20 years in the United States each year, an incidence rate of 16.7/100,000.[22] There are fewer than 2,500 deaths from childhood cancer nationally each year, a mortality rate of 2.8/100,000.[23] There were an average of 131 new cases of childhood cancer diagnosed in the four Northern Plains states combined each year between 2001 and 2005 (16.7/100,000), and an average of 19 childhood cancer deaths each year (2.5/100,000).

The impact of childhood cancer compared to other causes of mortality varies by age group.[22] Among children under five years of age, half of all mortality is attributable to congenital malformations and conditions arising in the perinatal period. From ages 5 through 19 years, the majority of childhood deaths are caused by unintentional injury, suicide, or homicide. Nationally, cancer accounted for 8% of deaths among children under 5 years of age in 2004, 18% of deaths among children ages 5 to 9 years, 13% of deaths among children ages 10 to 14 years, and 5% of deaths among children ages 15 to 19 years.[23] Mortality patterns in the Northern Plains states are consistent with the national patterns (Figure 1; Appendix 3).

Figure 1. Causes of Death by Age Group in the Northern Plains States, 2001-2005



[22] US Cancer Statistics Working Group. *United States Cancer Statistics: 1999-2004 Incidence and Mortality Web-Based Report.* Atlanta: US Department of Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute. 2007. Available at www.cdc.gov.uscs.

[23] Heron MP. Deaths: Leading causes for 2004. National Vital Statistics Reports. Vol. 56, no. 5. Hyattsville, MD: National Center for Health Statistics. 2007.

CLASSIFICATION AND DISTRIBUTION OF CHILDHOOD CANCERS

Childhood cancers are classified first by morphology (histology, or the type of cells involved and how those cells behave) and secondarily by site (Appendix 2).[24] In contrast, adult cancers are classified first by site and secondarily by morphology. Childhood cancers are divided into 12 main diagnostic groups; several of the diagnostic groups are further subdivided.

Leukemias, myeloproliferative diseases, and myelodysplasic disorders (Diagnostic Group I) account for more than one-quarter of all cases of childhood cancer in the Northern Plains states and in the United States as a whole (Figure 2; Appendix 4). The next most common childhood cancers are central nervous system and miscellaneous intracranial and intraspinal neoplasms (Diagnostic Group III); followed by lymphomas and reticuloendothelial neoplasms (Diagnostic Group II);, and other malignant epithelial neoplasms and malignant melanomas (Diagnostic Group XI). These four diagnostic groups account for more than two-thirds of the childhood cancers in the Northern Plains states and the United States. The remaining types of childhood cancer are rare.

The relative distribution of cancers differs by age group (Appendix 4). Among children from birth through 4 years of age, leukemias, myeloproliferative diseases, and myelodysplasic disorders account for more than one-third of all cases (Figure 3A), followed by central nervous system and miscellaneous intracranial and intraspinal neoplasms; and neuroblastoma and other peripheral nervous system tumors (Diagnostic group IV). These three types of cancer account for nearly three-quarters of all cancers in this age group.

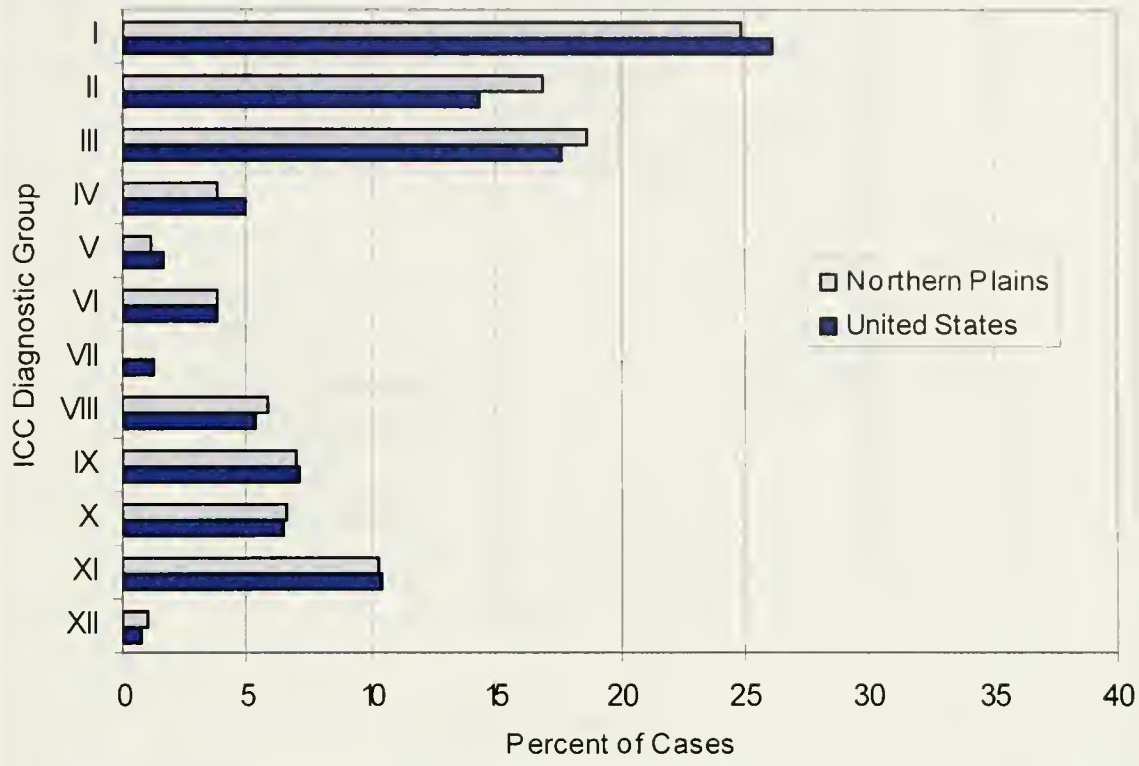
Among children ages 5 through 9 years (Figure 3B), leukemias, myeloproliferative diseases, and myelodysplasic disorders and central nervous system and miscellaneous intracranial and intraspinal neoplasms each account for one-quarter of all cancers. Together with renal tumors (Diagnostic Group VI), these account for two-thirds of cancers in this age group.

Among children ages 10 through 14 years (Figure 3C), leukemias, myeloproliferative diseases, and myelodysplasic disorders; lymphomas and reticuloendothelial neoplasms; and central nervous system and miscellaneous intracranial and intraspinal neoplasms account for two-thirds of all cancers.

Among children ages 15 through 19 years (Figure 3D), other malignant epithelial neoplasms and malignant melanomas accounts for more than one-quarter of all cancers, followed by lymphomas and reticuloendothelial neoplasms; leukemias, myeloproliferative diseases, and myelodysplasic disorders; and malignant bone tumors (Diagnostic Group VIII). These four groups account for three-quarters of the cancers in this age group.

[24] Steliarova-Foucher et al., 2005. International Classification of Childhood Cancer, Third Edition. *Cancer* 103:1457-1467.

Figure 2. Distribution of Childhood Cancers in the Northern Plains States, 2001-2005, and the United States, 2002-2004.[25]

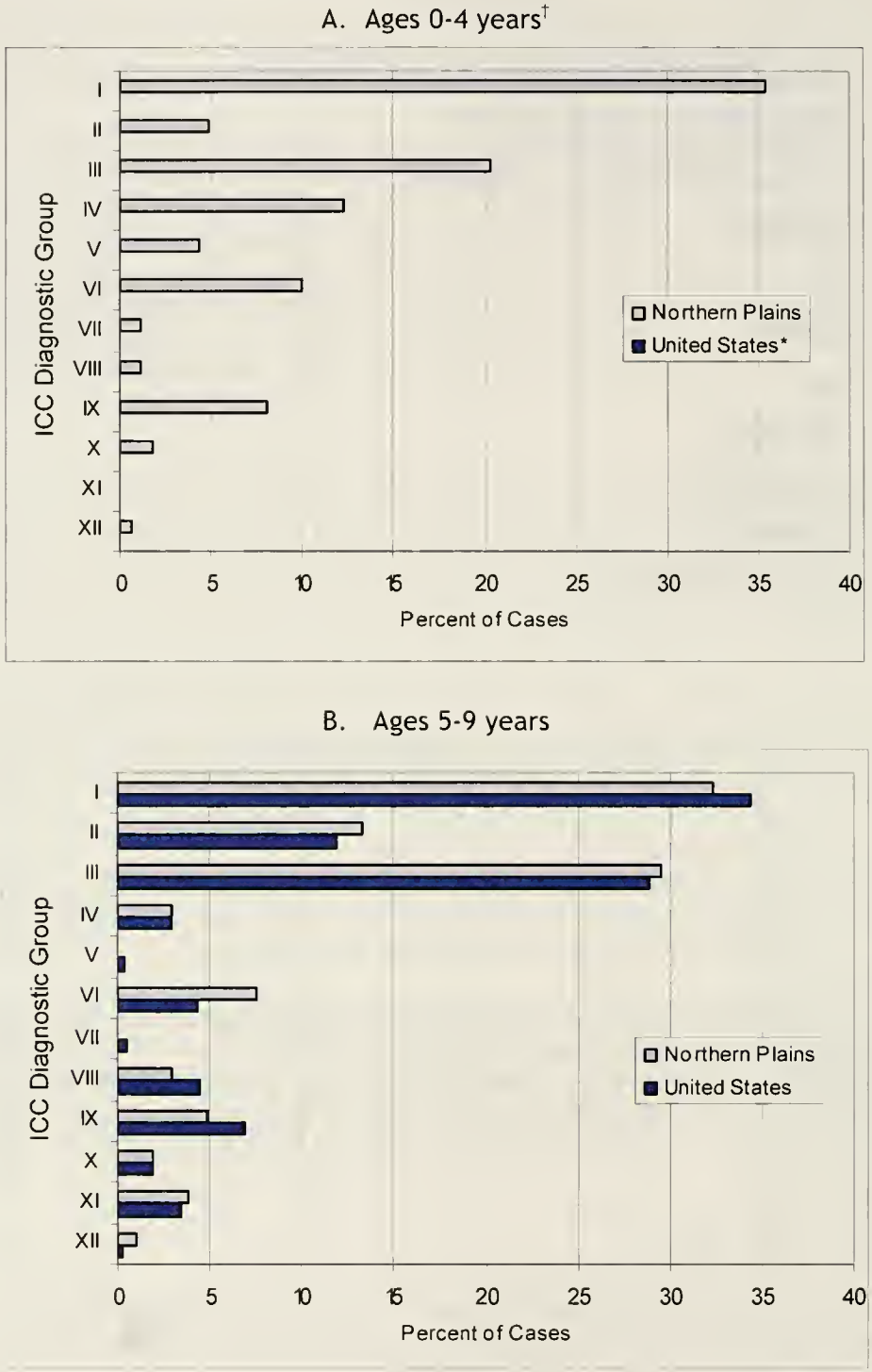


International Classification of Childhood Cancer Diagnostic Groups

I. Leukemias, myeloproliferative diseases, and myelodysplastic disorders
II. Lymphomas and reticuloenothelial neoplasms
III. Central nervous system and miscellaneous intracranial and intraspinal neoplasms
IV. Neuroblastoma and other peripheral nervous cell tumors
V. Retinoblastoma
VI. Renal tumors
VII. Hepatic tumors
VIII. Malignant bone tumors
IX. Soft tissue and other extraosseous sarcomas
X. Germ cell tumors, trophoblastic tumors, and neoplasms of the gonads
XI. Other malignant epithelial neoplasms and malignant melanomas
XII. Other and unspecified malignant neoplasms

[25] US Cancer Statistics Working Group. *United States Cancer Statistics: 1999-2004 Incidence and Mortality Web-Based Report.* Atlanta: US Department of Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute. 2007. Available at www.cdc.gov.uscs

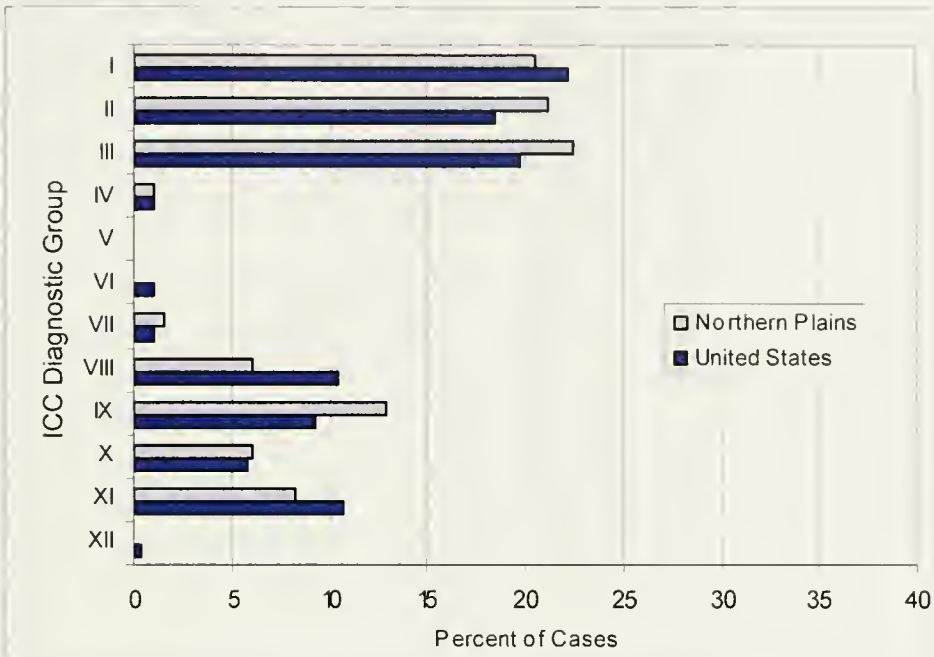
Figure 3. Distribution of Childhood Cancers by Age Groups in the Northern Plains States, 2001-2005, and the United States, 2002-2004.[26]



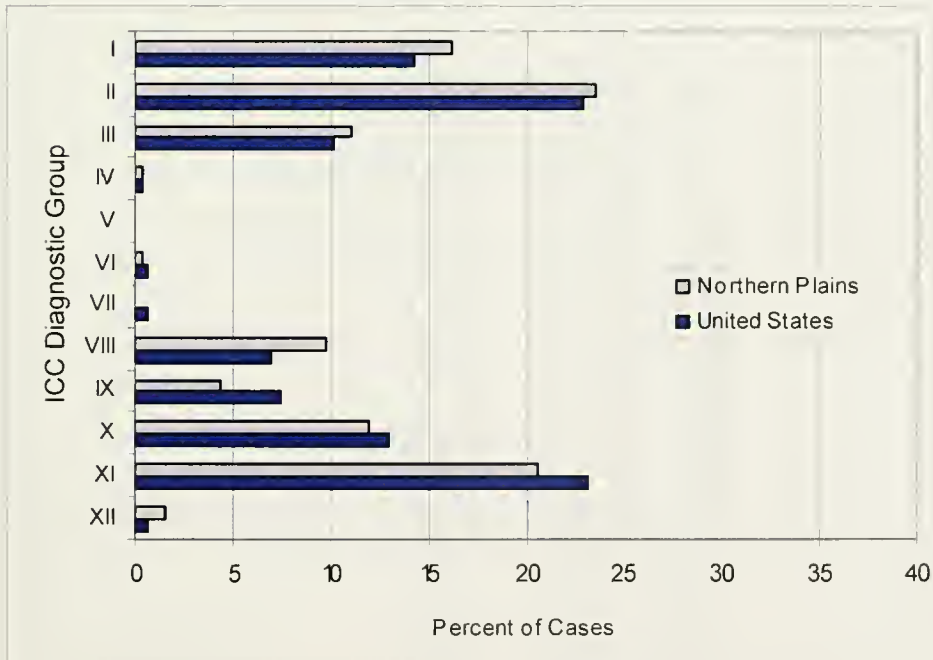
[26] US Cancer Statistics Working Group. *United States Cancer Statistics: 1999-2004 Incidence and Mortality Web-Based Report.* Atlanta: US Department of Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute. 2007. Available at www.cdc.gov.uscs

† United States data are not available for ages 0-4 years

C. Ages 10-14 years



D. Ages 15-19 years



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CHILDHOOD CANCER INCIDENCE AND MORTALITY RATES IN THE NORTHERN PLAINS STATES, 2001-2005

Vertical lines on the bar graphs represent 95% Confidence Intervals around the point estimates of incidence and mortality rates for the Northern Plains states. Estimated rates based on fewer than five cases are flagged with a caret (^) symbol. Absence of a bar for the Northern Plains states in any graph indicates no cases for that category.

Incidence and mortality rates for the United States are for 2002-2004, from the Centers for Disease Control and Prevention's United States Cancer Statistics website, http://apps.nccd.cdc.gov/uscs/ National data are not available for the 0-4 year age group. National data are not reported if rates are based on fewer than 16 cases per cell.

Please see Appendix 7 for complete tabulation of cancer incidence and mortality rates by state, for the Northern Plains states as a group, and for the United States as a whole.

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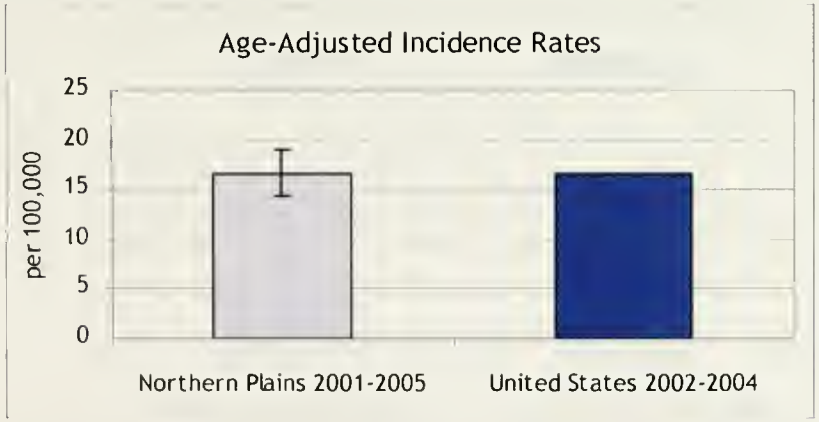
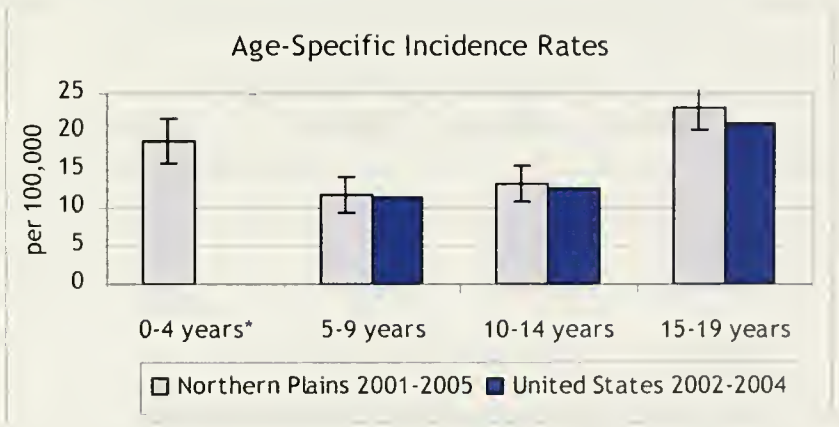
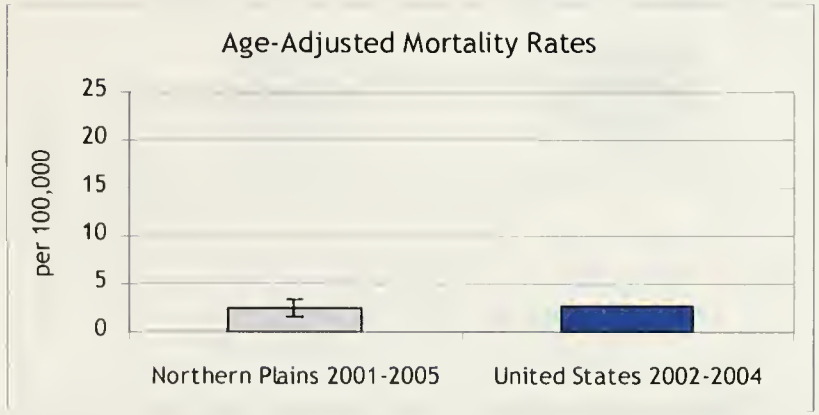
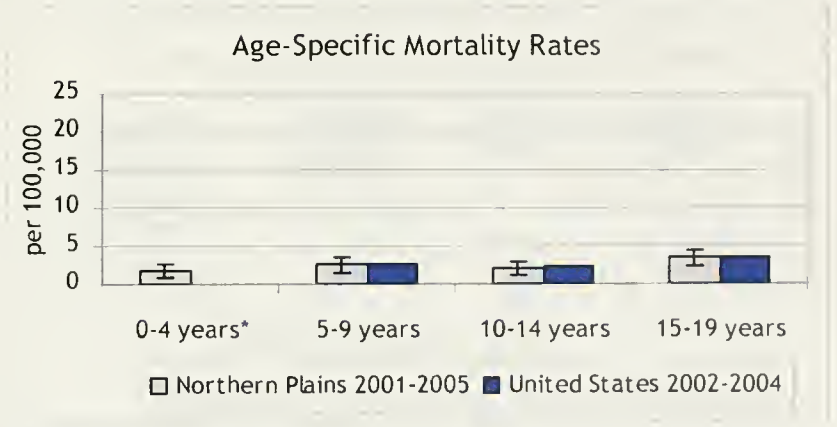
ALL SITES

The incidence of childhood cancer at all sites in the Northern Plains states is similar to the incidence in the United States as a whole, both on an age-adjusted and an age-specific basis. Mortality from childhood cancer at all sites is also similar on both an age-adjusted and age-specific basis.





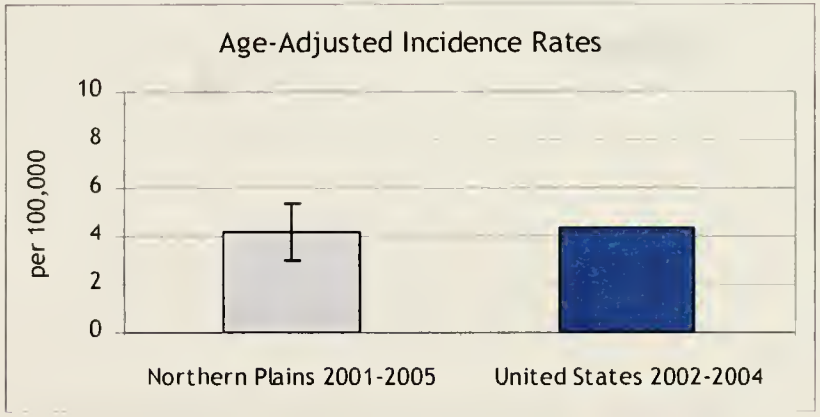


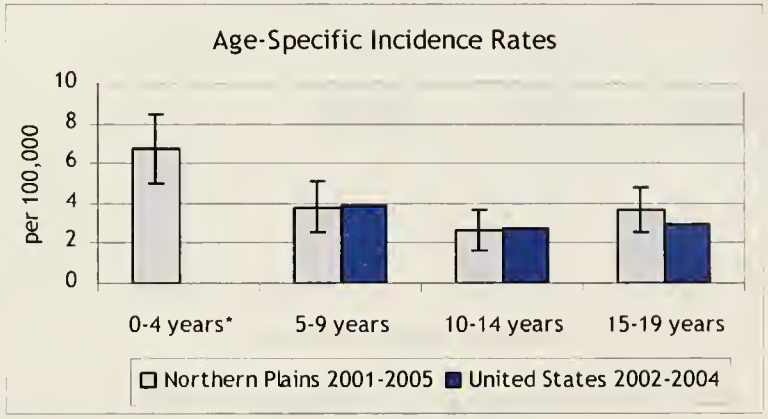


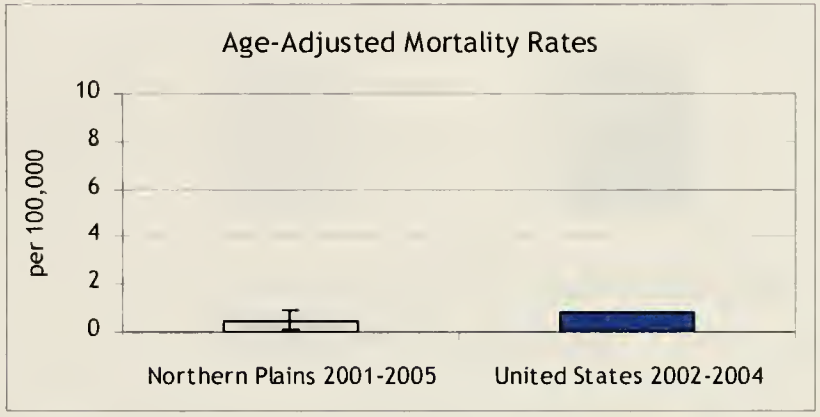
* Age-specific rates are not available for the United States for age group 0-4 years.

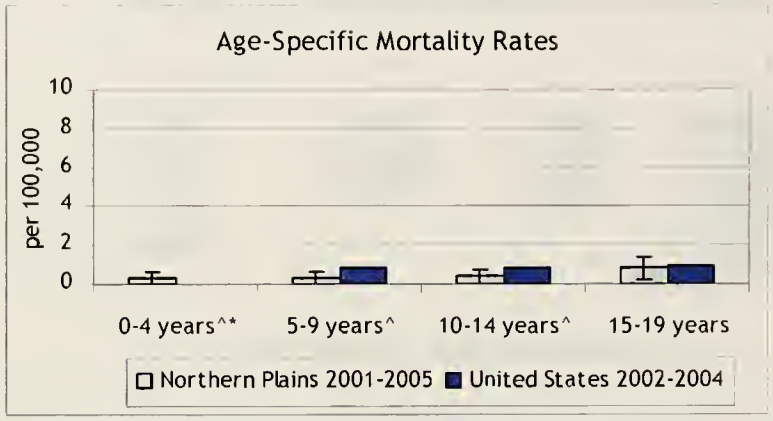
I. LEUKEMIAS, MYELOPROLIFERATIVE DISEASES, AND MYELOPROLIFERATIVE DISORDERS

The incidence of childhood leukemias, myeloproliferative diseases, and myeloproliferative disorders in the Northern Plains states is similar to the incidence in the United States as a whole, both on an age-adjusted and an age-specific basis. Mortality from the leukemias is also similar on both an age-adjusted and age-specific basis.





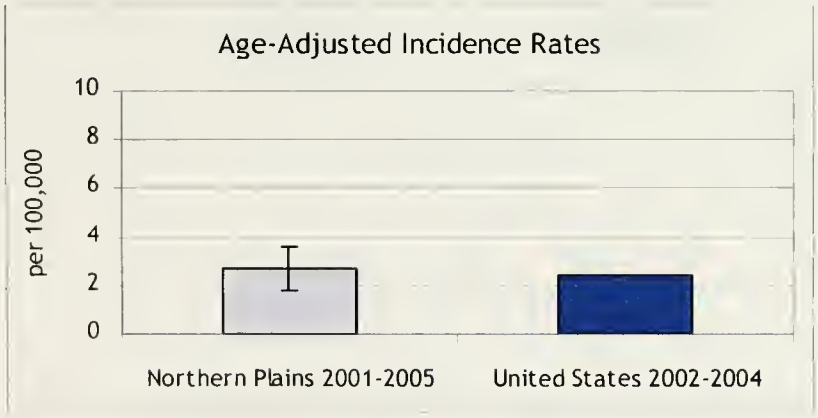


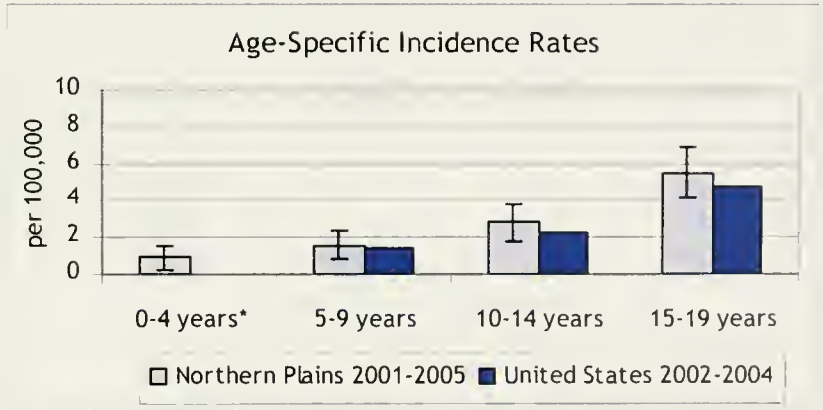


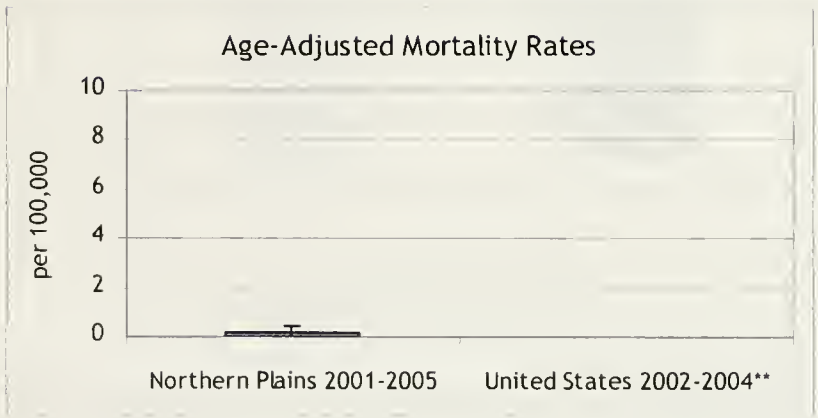
* Age-specific rates are not available for the United States for age group 0-4 years.
^ Northern Plains estimate based on fewer than five cases.

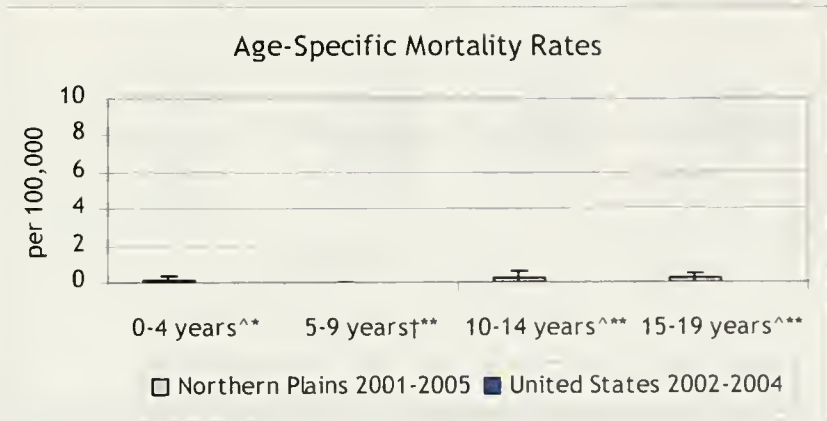
II. LYMPHOMAS AND RETICULOENDOTHELIAL NEOPLASMS

The incidence of childhood lymphomas and reticuloendothelial neoplasms in the Northern Plains states is similar to the incidence in the United States as a whole, both on an age-adjusted and an age-specific basis. Age-adjusted mortality from childhood lymphomas and reticuloendothelial neoplasms is also similar on an age-adjusted basis; national age-specific mortality rates are not available.







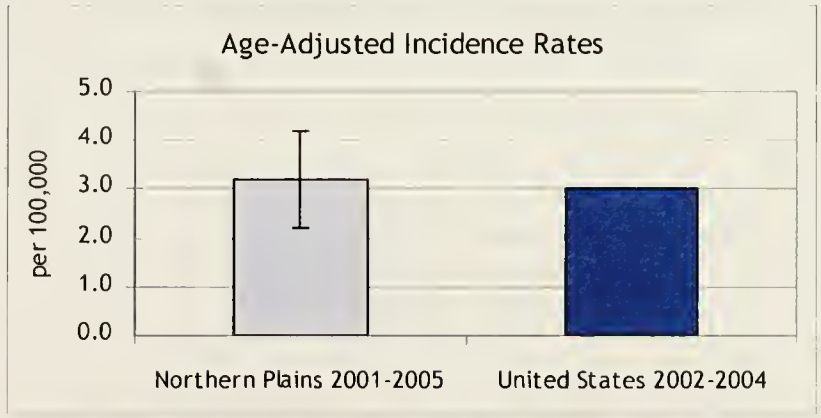


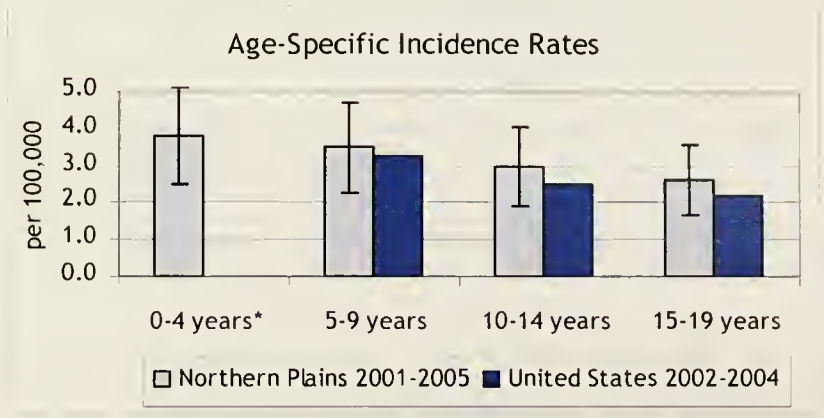
** Data for the United States are not available if estimates are based on fewer than 16 cases.

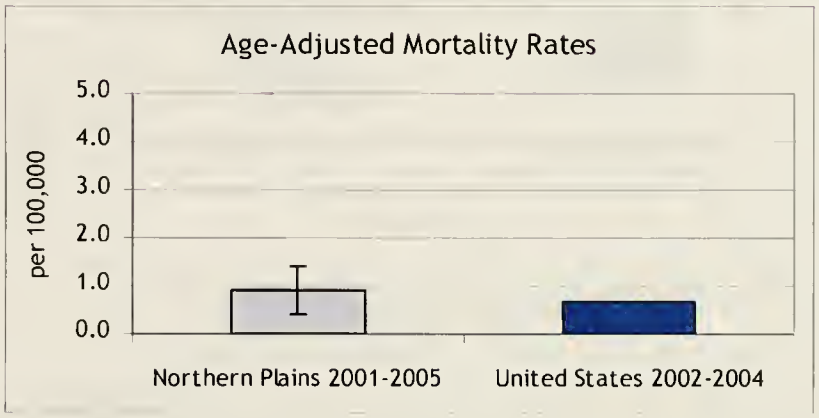
* Age-specific rates are not available for the United States for age group 0-4 years.
^ Northern Plains estimate based on fewer than five cases.
† Northern Plains had no cases in this age group.

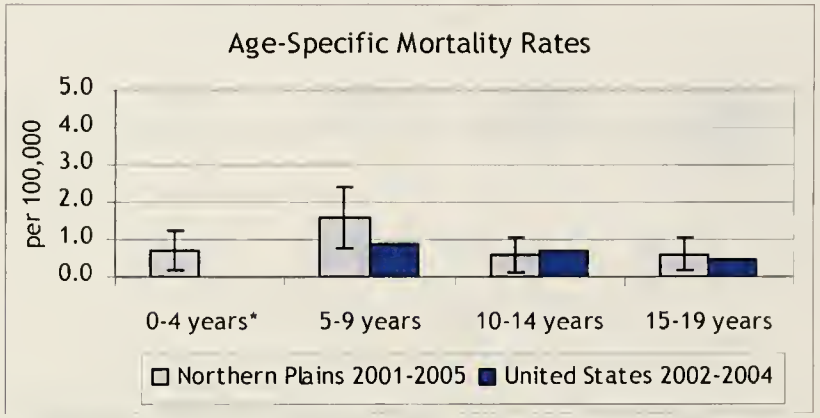
III. CENTRAL NERVOUS SYSTEM AND MISCELLANEOUS INTRACRANIAL AND INTRASPINAL NEOPLASMS

The incidence of childhood cancer of the central nervous system and miscellaneous intracranial and intraspinal neoplasms in the Northern Plains states is similar to the incidence in the United States as a whole, both on an age-adjusted and an age-specific basis. Mortality from childhood central nervous system cancers is also similar on both an age-adjusted and age-specific basis.





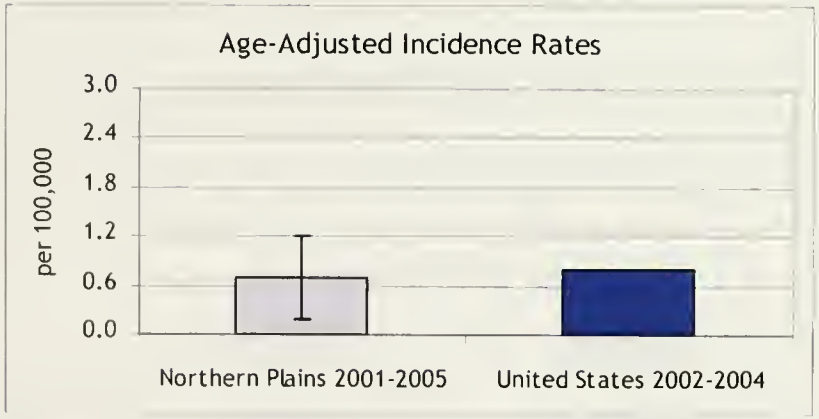


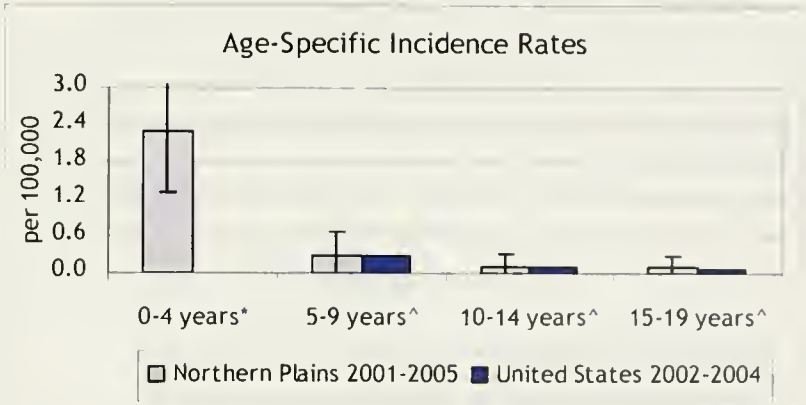


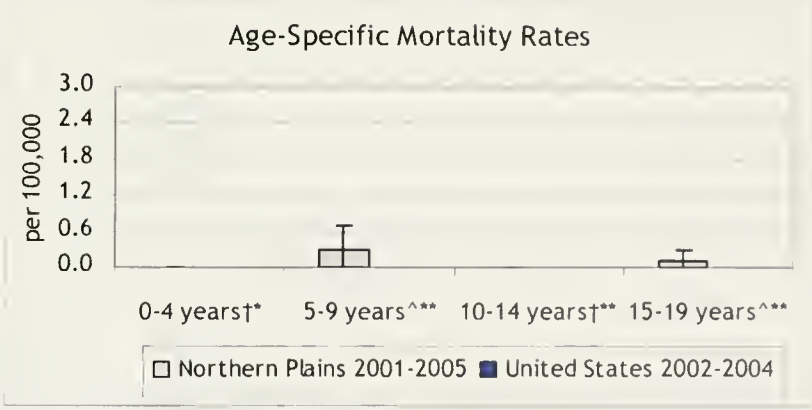
* Age-specific rates are not available for the United States for age group 0-4 years.

IV. NEUROBLASTOMA AND OTHER PERIPHERAL NERVOUS CELL TUMORS

The incidence of childhood neuroblastoma and other peripheral nervous cell tumors in the Northern Plains states is similar to the incidence in the United States as a whole, both on an age-adjusted and an age-specific basis. Age-specific and age-adjusted mortality rates are not available for the United States as a whole. Most cases of neuroblastoma are diagnosed in children under one year of age. Only 10% of all cases occur in individuals older than five years.





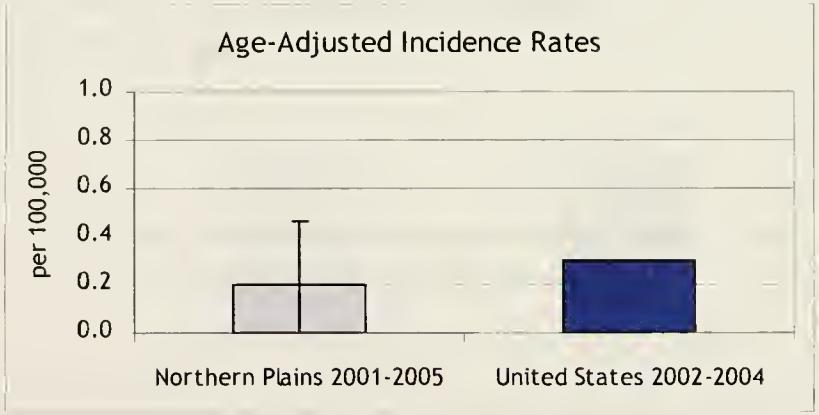


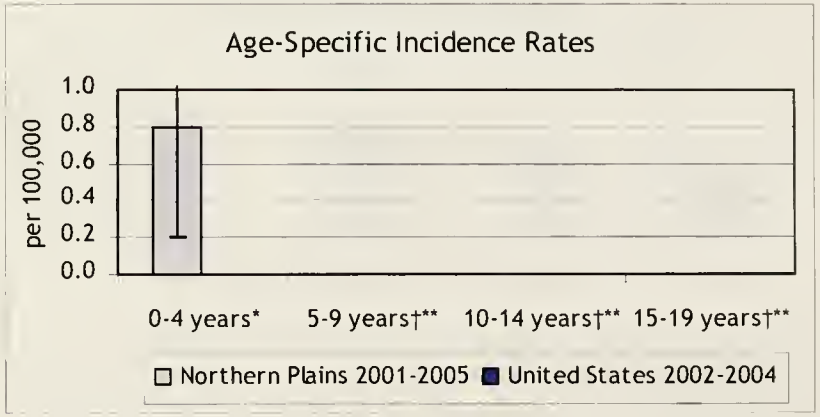
** Data for the United States are not available if estimates are based on fewer than 16 cases.

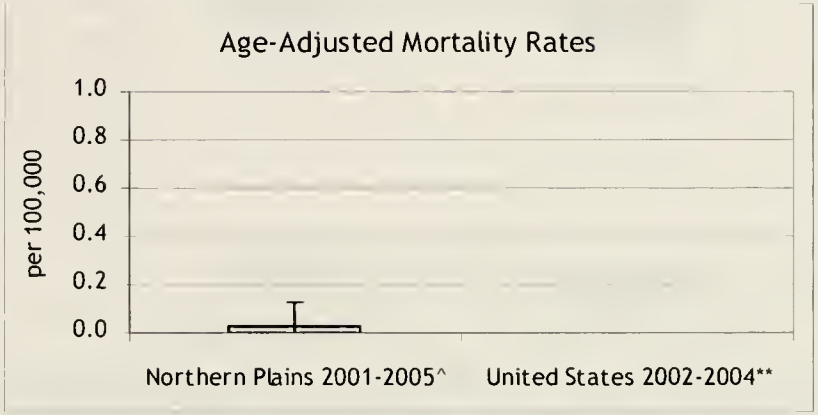
* Age-specific rates are not available for the United States for age group 0-4 years.
^ Northern Plains estimate based on fewer than five cases.
† Northern Plains had no cases in this age group.

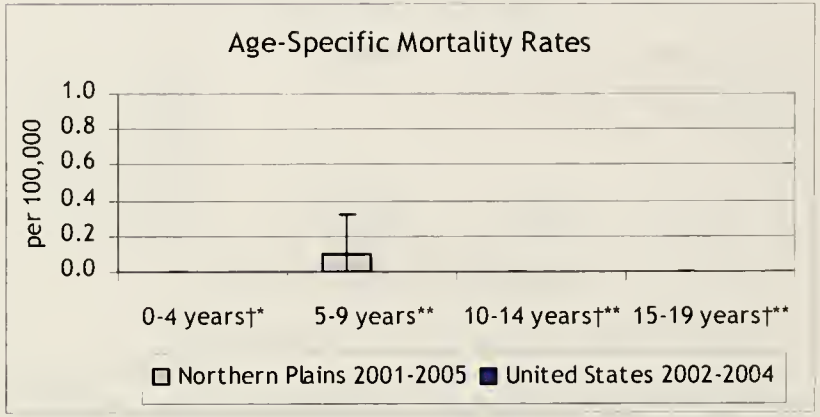
V. RETINOBLASTOMA

The incidence of childhood retinoblastoma in the Northern Plains states is similar to the incidence in the United States as a whole on an age-adjusted basis. Age-specific incidence rates are not available for the United States as a whole. Age-specific incidence and mortality data are not available for the United States as a whole. Two-thirds of cases of retinoblastoma are diagnosed before the age of five years.







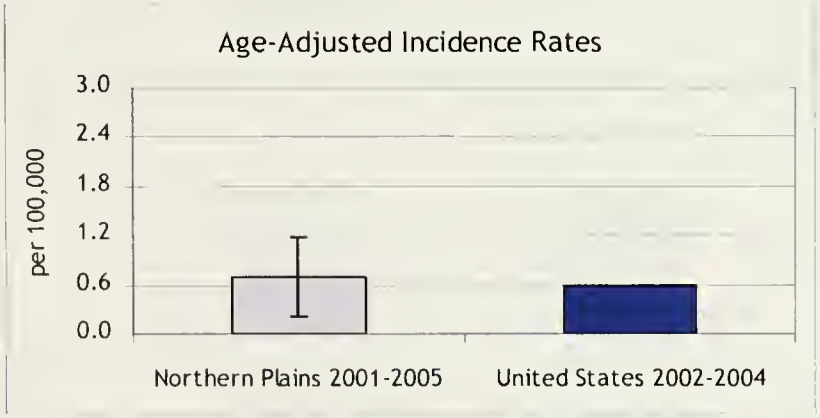


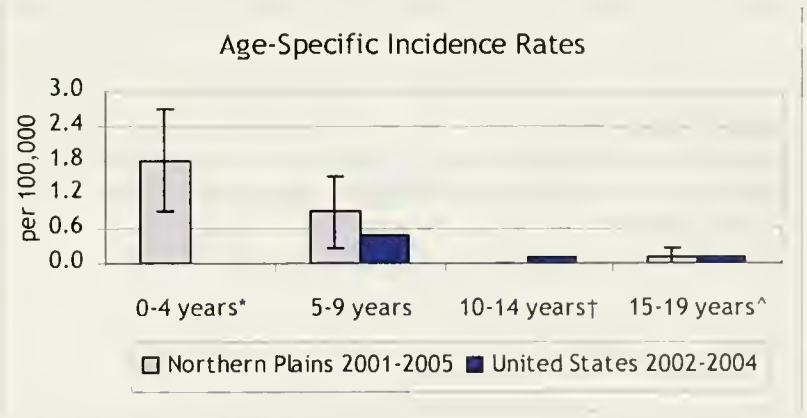
** Data for the United States are not available if estimates are based on fewer than 16 cases.
^ Northern Plains estimate based on fewer than five cases.

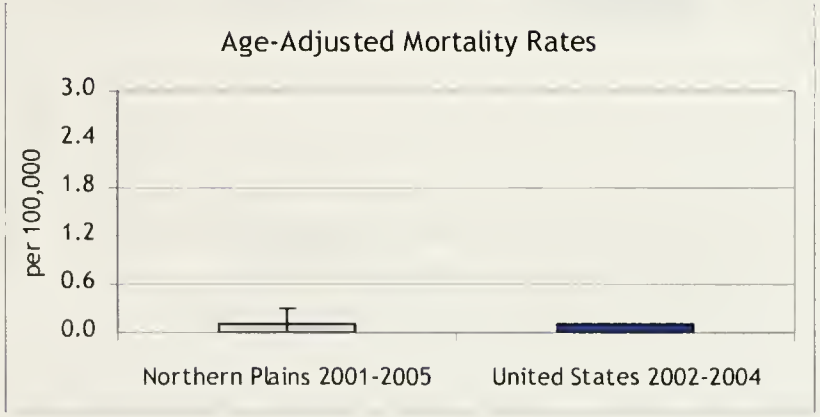
* Age-specific rates are not available for the United States for age group 0-4 years.
† Northern Plains had no cases in this age group.

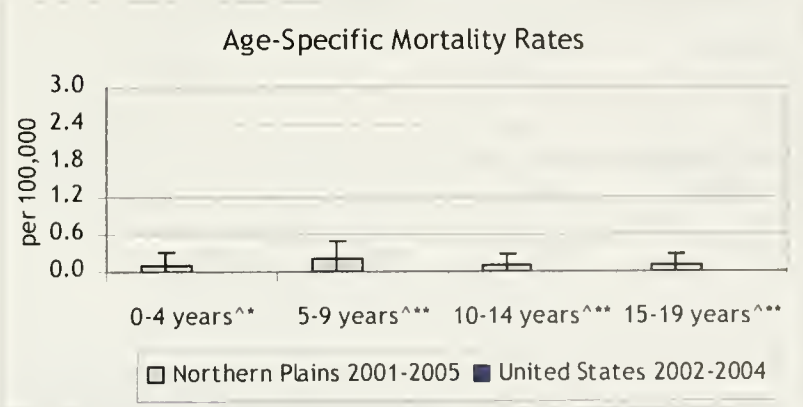
VI. RENAL TUMORS

The incidence of childhood renal tumors in the Northern Plains states is similar to the incidence in the United States as a whole, both on an age-adjusted and an age-specific basis. Age-adjusted mortality from childhood renal tumors is similar in the Northern Plains states and the United States as a whole. Age-specific mortality rates are not available for the United States as a whole. The great majority (95%) of renal tumors in children are Wilms' tumor, which has a strong genetic component.





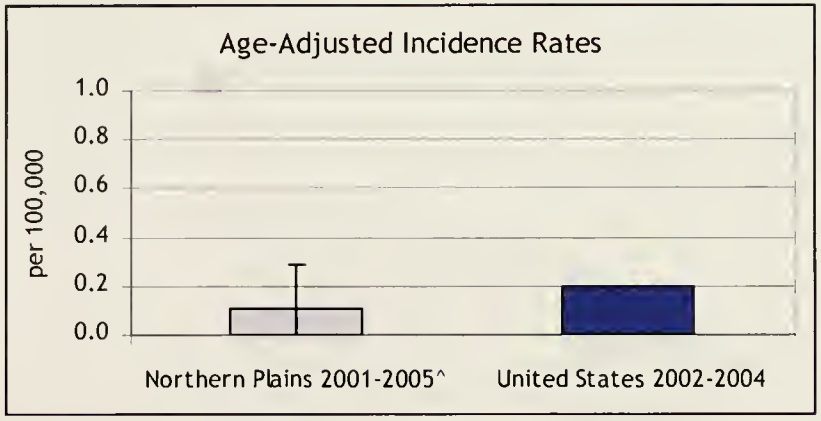


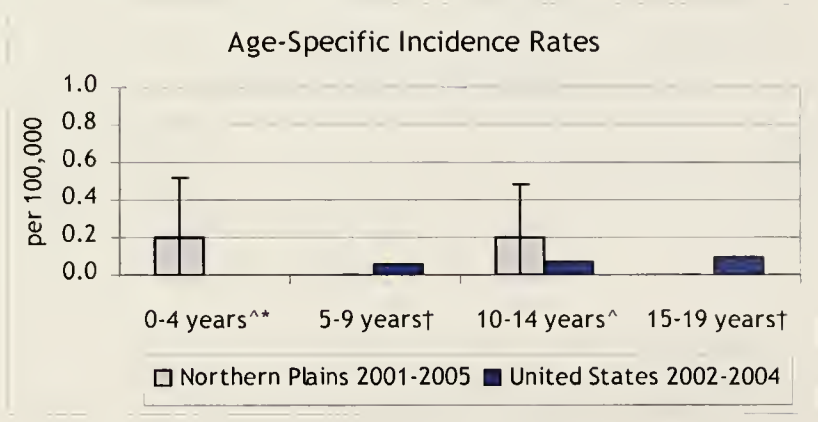


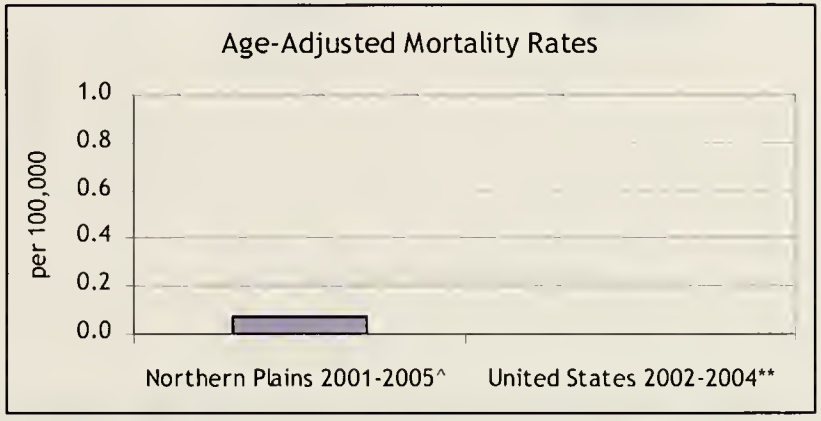
* Age-specific rates are not available for the United States for age group 0-4 years.
† Northern Plains had no cases in this age group.
^ Northern Plains estimate based on fewer than five cases.
** Data for the US are not available if estimates are based on fewer than 16 cases.

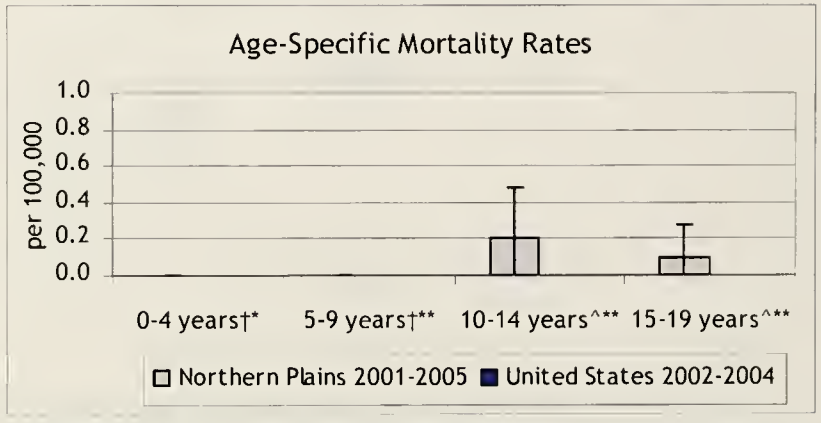
VII. HEPATIC TUMORS

The incidence of childhood hepatic tumors in the Northern Plains states is similar to the incidence in the United States as a whole, both on an age-adjusted and an age-specific basis. Age-adjusted and age-specific mortality rates for hepatic tumors are not available for the United States as a whole.







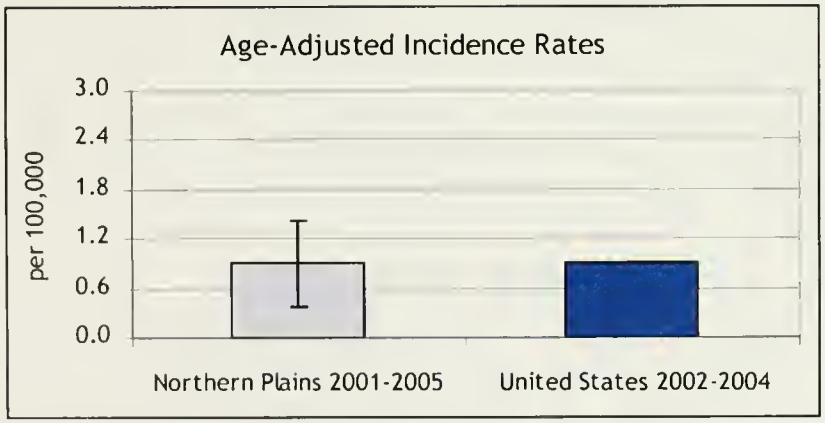


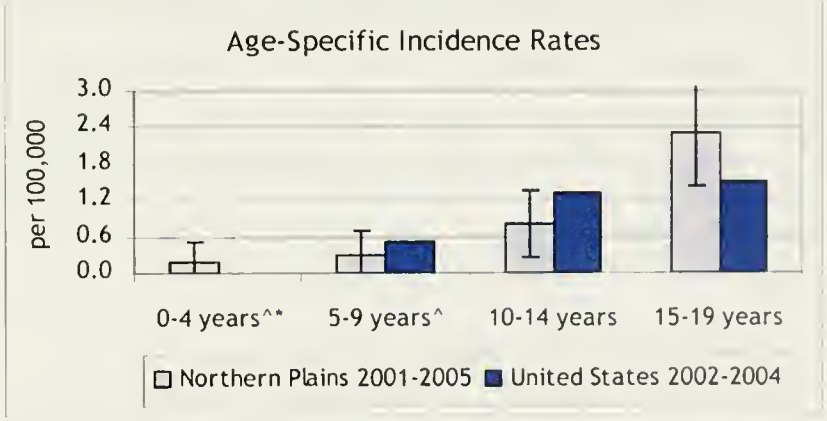
^ Northern Plains estimate based on fewer than five cases.
** Data for the United States are not available if estimates are based on fewer 16 cases.

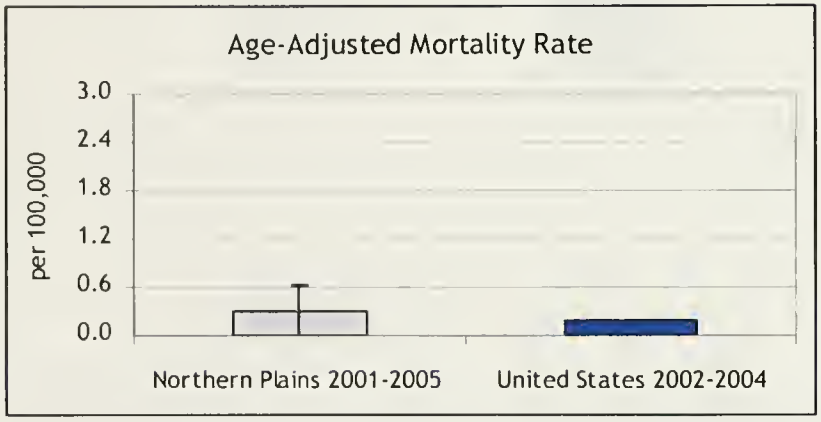
* Age-specific rates are not available for the United States for age group 0-4 years.
† Northern Plains had no cases in this age group.

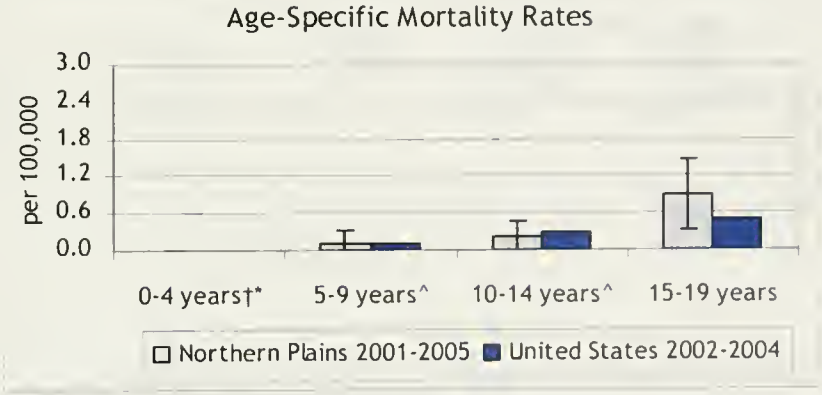
VIII. MALIGNANT BONE TUMORS

The incidence of childhood malignant bone tumors in the Northern Plains states is similar to the incidence in the United States as a whole, both on an age-adjusted and an age-specific basis. Mortality is also similar on both an age-adjusted and an age-specific basis. The incidence of malignant bone tumors increases with age through childhood.





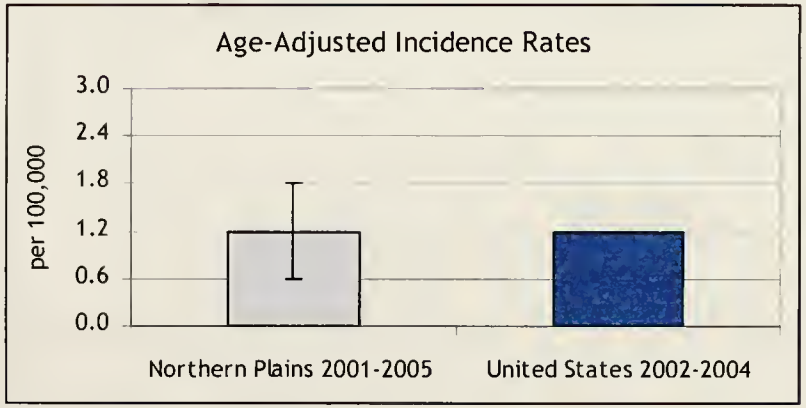


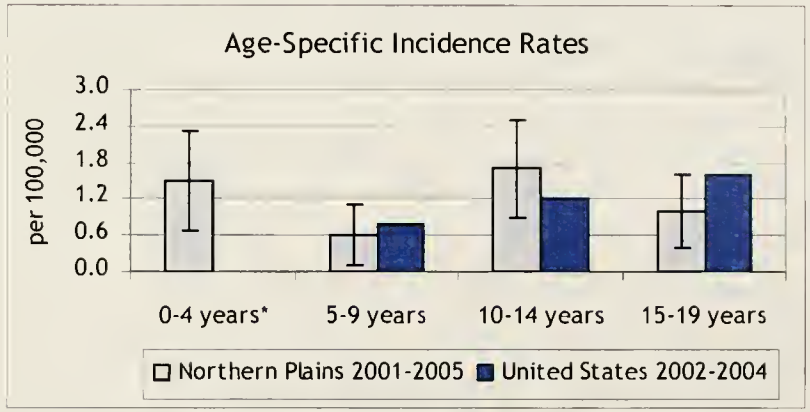


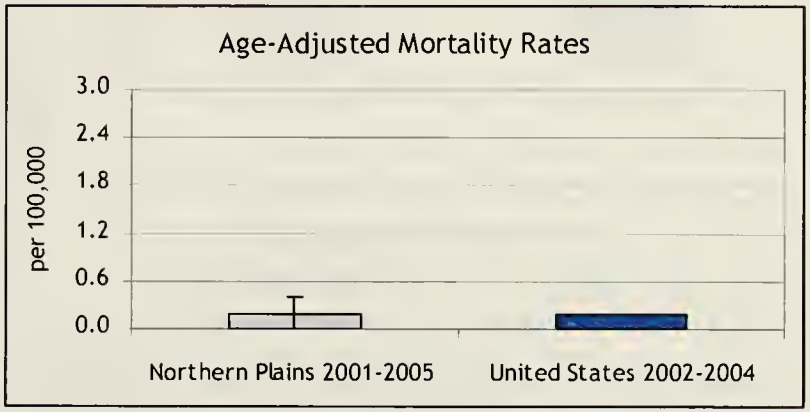
* Age-specific rates are not available for the United States for age group 0-4 years.
^ Northern Plains estimate based on fewer than five cases.
† Northern Plains had no cases in this age group.

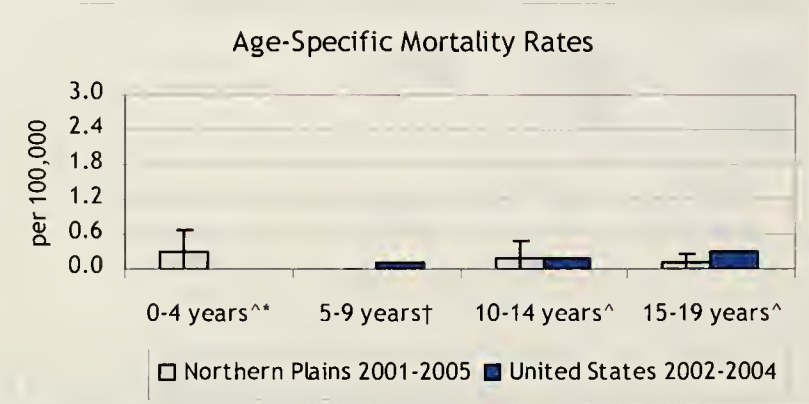
IX. SOFT TISSUE AND OTHER EXTRAOSSEOUS SARCOMAS

The incidence of childhood soft tissue and other extraosseous sarcomas in the Northern Plains states is similar to the incidence in the United States as a whole, both on an age-adjusted and an age-specific basis. Mortality is also similar on an age-adjusted basis. The age-specific mortality rate among Northern Plains children ages 15-19 years is slightly but statistically significantly lower than the United States rate, although this should be interpreted with caution in view of the small number of deaths in the Northern Plains states.





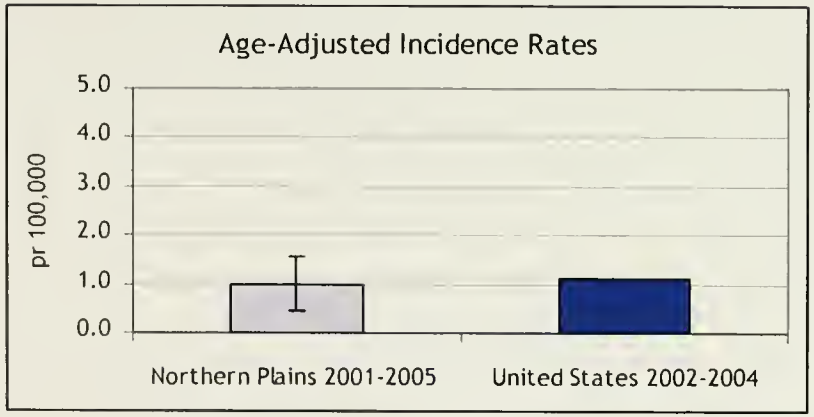


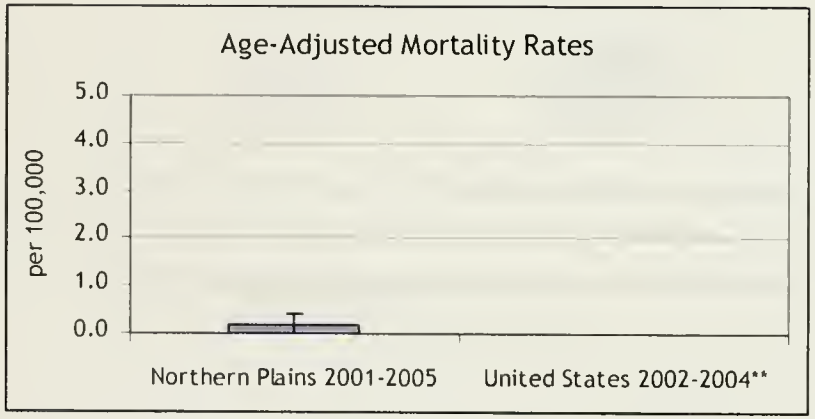


* Age-specific rates are not available for the United States for age group 0-4 years.
^ Northern Plains estimate based on fewer than five cases.
† Northern Plains had no cases in this age group.

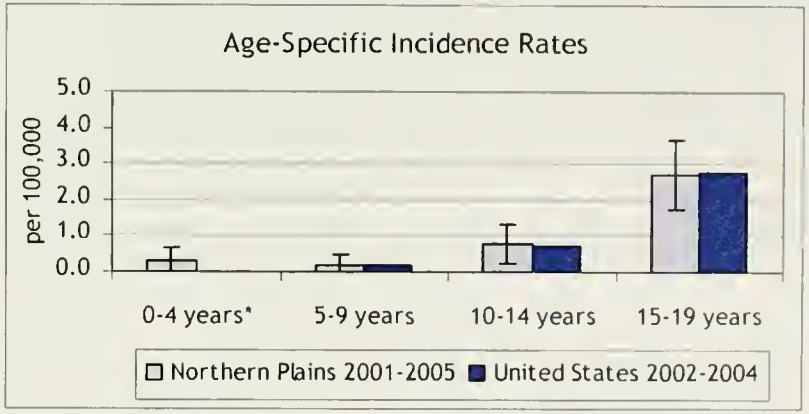
X. GERM CELL TUMORS, TROPHOBLASTIC TUMORS, AND NEOPLASMS OF THE GONADS

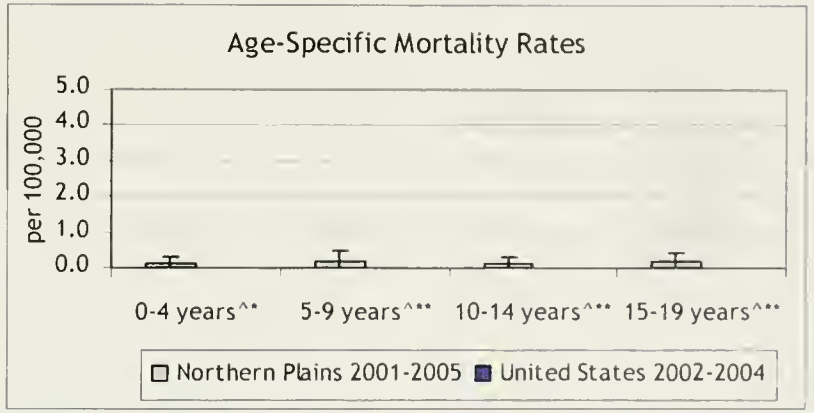
The incidence of childhood germ cell tumors, trophoblastic tumors, and neoplasms of the gonads in the Northern Plains states is similar to the incidence in the United States as a whole, both on an age-adjusted and an age-specific basis. Age-adjusted and age-specific mortality rates are not available for the United States as a whole.





** Data for the United States are not available if estimates are based on fewer than 16 cases.

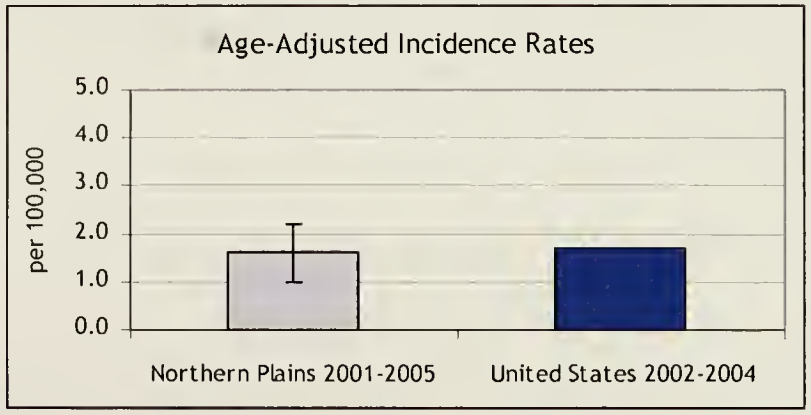


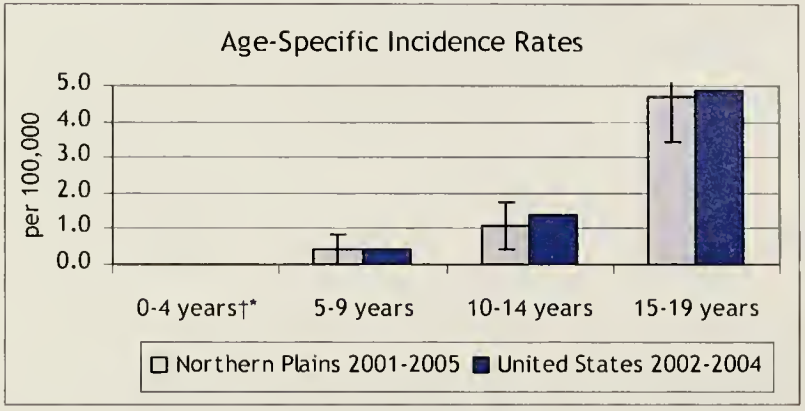


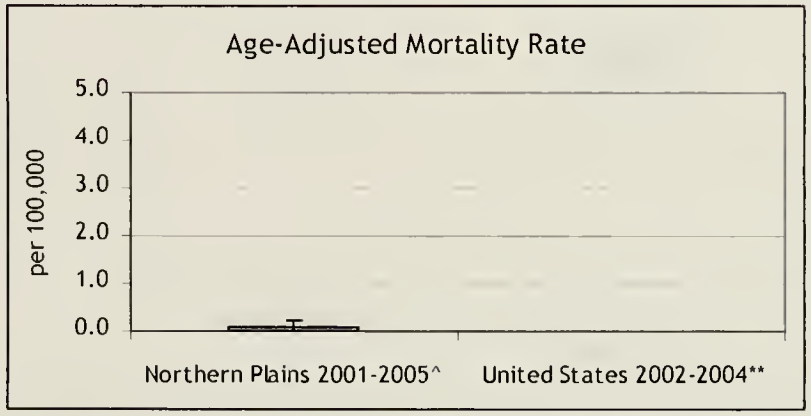
* Age-specific rates are not available for the United States for age group 0-4 years.
^ Northern Plains estimate based on fewer than five cases.

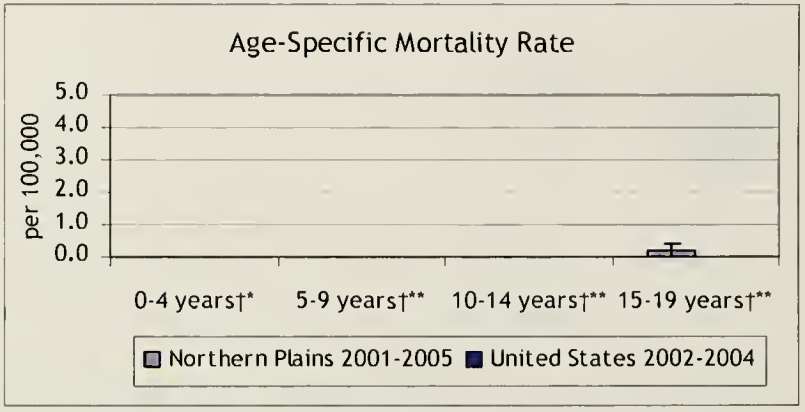
XI. OTHER MALIGNANT EPITHELIAL NEOPLASMS AND MALIGNANT MELANOMAS

The incidence of other childhood malignant epithelial neoplasms and malignant melanomas in the Northern Plains states is similar to the incidence in the United States as a whole, on both an age-adjusted and age-specific basis. Age-adjusted and age-specific mortality rates are not available for the United States as a whole. There is a noticeable increase in incidence among 15 -19 year olds in both the Northern Plains states and the United States as a whole.







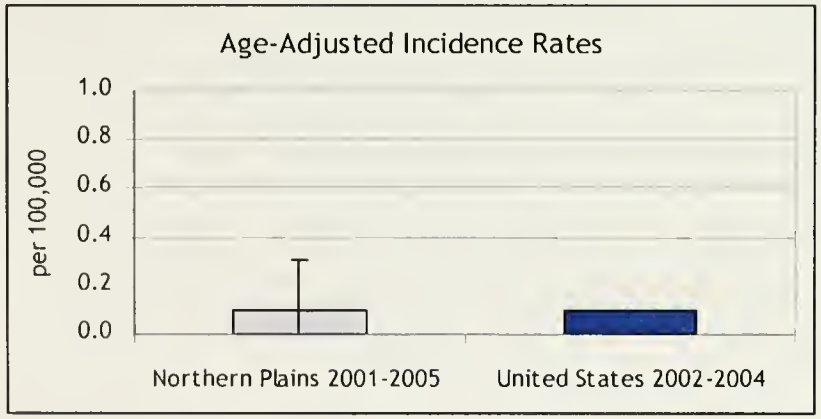


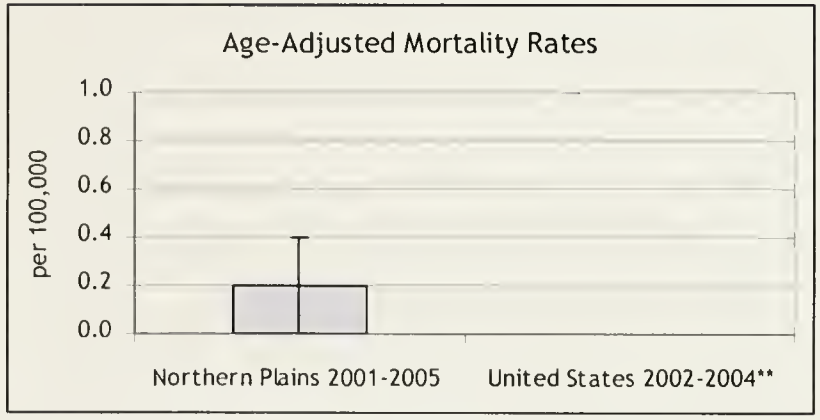
** Data for the United States are not available if estimates are based on fewer than 16 cases.
^ Northern Plains estimate based on fewer than five cases.

* Age-specific rates are not available for the United States for age group 0-4 years.
† Northern Plains had no cases in this age group.

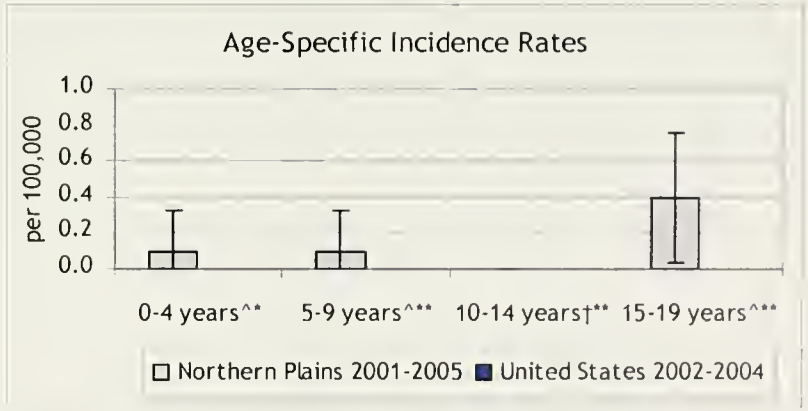
XII. OTHER AND UNSPECIFIED MALIGNANT NEOPLASMS

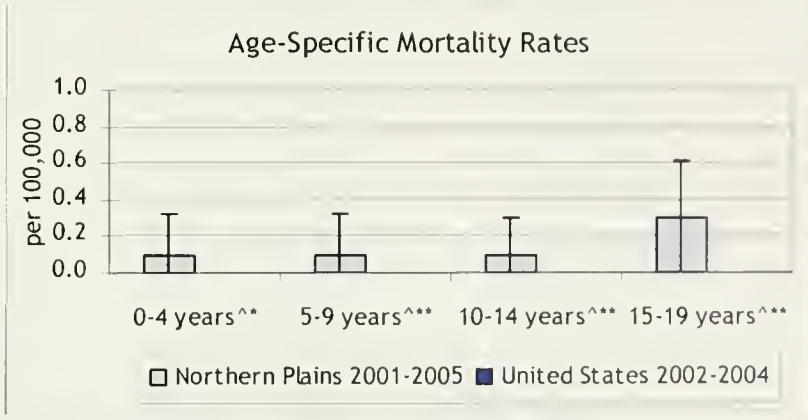
The incidence of all other and unspecified childhood neoplasms in the Northern Plains states is similar to the incidence in the United States as a whole on an age-adjusted basis. Age-specific incidence rates and age-adjusted incidence and mortality rates are not available for the United States as a whole.





** Data for the United States are not available f estimates are based on fewer than 16 cases.





* Age-specific rates are not available for the United States for age group 0-4 years.
^ Northern Plains estimate based on fewer than five cases.
† Northern Plains had no cases in this age group.

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APPENDICES

1. Technical Notes
2. Classification of Childhood Cancers
3. Causes of Childhood Death in the Northern Plains States, 2001-2005
4. Classification and Distribution of Childhood Cancer in the Northern Plains States, 2001-2005 and the United States, 2002-2004
5. 2000 United States Standard Population
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8. Data Sources

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APPENDIX 1

TECHNICAL NOTES

Registry Overviews

The **Montana Central Tumor Registry** (MCTR) is a central registry of all cancers diagnosed and/or treated in Montana. In 1979, the Montana legislature approved initial funding for the MCTR. In 1981, the legislature made cancer a reportable disease, requiring all hospitals in the state to report their cancer cases. The 1983 Montana legislature extended reporting requirements to independent clinical laboratories. The 1997 Montana legislature extended reporting requirements to physicians and other health care practitioners who diagnose and/or treat patients without referring them to a hospital.

Cancer is a reportable disease as stated in the **North Dakota** Administrative Rules. On July 1, 1996, administrative rules were adopted for mandatory reporting of all invasive and *in situ* carcinomas (except basal and squamous cell skin carcinomas or in situ carcinoma of the cervix uteri) and tumors of the central nervous system. All medical diagnostic laboratories, physicians, and other health care providers who administer screening, diagnostic or therapeutic services are required to report. Hospitals and other health care facilities that provide inpatient and/or outpatient services and mobile units that provide screening, diagnostic or therapeutic services also are required to report.

The **South Dakota Cancer Registry** (SDCR) is a statewide population-based cancer registry. It collects data on cancer incidence and reports on cancer incidence and mortality. It began in 1992 as a limited cancer data collection system that monitored cancer incidence through pathology reports and reports from hospital tumor registries approved by the American College of Surgeons. In 2001, SDCR became part of the National Program of Cancer Registries (NPCR). In 2005, South Dakota Codified Law 1-43-11 through 1-43-18 passed, requiring reporting by all entities detecting, diagnosing, and treating cancer cases in South Dakota. In 2006, the SDCR became a NAACCR certified central registry.

The **Wyoming Cancer Surveillance Program** (WCSP) is a statewide population-based cancer registry. Its mission is to maintain a nationally comparable population-based cancer incidence, follow-up, treatment and mortality monitoring system that collects, analyzes and disseminates information on all new cancer cases in Wyoming. In operation since 1966, the WCSP has been collecting cancer data on all cancer cases diagnosed or treated in Wyoming since 1962. The WCSP monitors cancer incidence through pathology reports and uniform reporting of information by health care providers in Wyoming. In 1977, a law was passed requiring reporting by all entities detecting, diagnosing and treating cancer cases in Wyoming (statute 35-1-240[b] and public law 102-515). In 1987, the first employee of the WCSP became a member of the North American Association of Central Cancer Registries (NAACCR). In 1995, the WCSP became member of the National Program of Cancer Registries (NPCR).

The National Program of Cancer Registries (NPCR) was established by Congress through the Cancer Registries Amendment Act in 1992, and administered by the Centers for Disease Control and Prevention (CDC). The NPCR collects data on the occurrence of cancer; the type, extent, and location of the cancer; and the type of initial treatment. The CDC provides funding for states to implement and enhance existing registries to meet national standards for completeness, timeliness and data quality.

The North American Association of Central Cancer Registries (NAACCR) is a professional organization that develops and promotes uniform data standards for cancer registration; provides education and training; certifies population-based registries; aggregates and publishes data from central cancer registries and promotes the use of cancer surveillance data and systems for cancer control and epidemiologic research, public health programs and patient care to reduce the burden of cancer in North America.

Data Collection

Cancer registries collect data on all cancer patients who are residents of their state, or who are residents of other states diagnosed or treated for cancer in their state. Registries have interstate exchange agreements with other states where their residents may go for diagnosis or treatment of cancer and collect data from those states.

Reportable Cancers

According to the NAACCR, the following tumors are to be submitted for reporting. Hospitals are required to submit reportable cancer cases to their respective state registries within six months after a patient's discharge date.

A. All malignant neoplasms, including *in situ*

Exception: Basal cell carcinoma (BCC) or squamous cell carcinoma (SCC) of the skin. Note: BCC and SCC of the labia, vagina, vulva, clitoris, penis, scrotum, prepuce, and anus must be reported. Carcinoma in situ of the cervix (CIS), intraepthelial neoplasia grade III (8077/2) of the cervix (CIN III), prostate (PIN III), vulva (VIN III), vagina (VAIN III), and anus (AIN III) may be reportable because of their classification as *insitu*, depending on individual state law.

B. All benign tumors of the brain, including meninges, brain, spinal cord, cranial nerves, and other parts of the central nervous system, pituitary gland, craniopharyngeal duct, and pineal gland.

C. All carcinoid tumor (malignant, benign, and NOS)

D. Ambiguous terms that are reportable

Apparent, apparently
Appears
Comparable with
Compatible with
Consistent with
Favor(s)
Malignant-appearing
Most likely
Presumed
Probably
Suspect, suspected
Suspicious
Typical, typical of

E. Ambiguous terms that are not reportable:

Approaching
Cannot be ruled out
Equivocal
Possible
Potential
Questionable
Suggests
Very close to
Worrisome

Incidence and Mortality Rates

The Incidence Rate is the number of new cases diagnosed in the population at risk during a specified period of time. The Mortality Rate is the number of deaths occurring in the population at risk during a specified period of time. Both the Incidence Rate and the Mortality Rate are expressed per 100,000 people per year. Because cancer incidence and mortality vary with age, and because populations vary in their age structures, Incidence and Mortality Rates are usually age-adjusted to a reference or standard population.

Age-adjusted rates using the same reference population may be compared directly. For example, the rates for the four individual states reported here can be compared to one another and to national rates. Rates based on data aggregated for the four states can also be compared to national rates. Since 1999, the reference population has been the 2000 United States Standard Population (Appendix 4). Prior to 1999, the most common reference population for cancer reporting was the 1970 United States Standard Population. Rates standardized to different reference populations cannot be compared.

Confidence Intervals

Estimated Incidence and Mortality Rates are computed by dividing the number of cases observed by the population or segment of a population at risk, and projecting it to the number that would be observed in 100,000 people. Rates computed from small numbers of cases in small populations are unstable and fluctuate greatly from year to year. Using five-year aggregated data helps offset this instability but does not entirely eliminate it. The Confidence Interval associated with a computed Incidence or Mortality Rate is a statistical measure of how precise the estimated rate is. It is customary to use a 95% Confidence Interval, indicating that the true Incidence or Mortality Rate lies within that interval with 95% certainty.

In general, the fewer the number of cases and the smaller the population at risk, the wider the Confidence Interval will be, meaning there is more uncertainty about the precise value of the estimated rate. Because of the small number of childhood cancer cancers, even aggregated across four states and five years, the Confidence Intervals for some of the rates presented in this report are large.

Comparing Incidence and Mortality Rates

When comparing Incidence or Mortality Rates, for example comparing sexes, comparing states, or comparing a state to the United States as a whole, it is necessary to look at the 95% Confidence Intervals around the estimated rates for both groups. If the Confidence Intervals overlap, the two rates are not statistically significantly different.

APPENDIX 2

CLASSIFICATION OF CHILDHOOD CANCERS
SITE/HISTOLOGY CODE BASED ON INTERNATIONAL CLASSIFICATION OF CHILDHOOD CANCER, THIRD EDITION (ICCC-3) BASED ON ICD-O-3[1]

Site Group	ICD-O-3 Histology (Type)	ICD-O-2/3 Site	Recode
I Leukemias, myeloproliferative diseases, and myelodysplastic diseases			
(a) Lymphoid leukemias	9820, 9823, 9826, 9827, 9831-9837, 9940, 9948	C000-C809	011
(b) Acute myeloid leukemias	9840, 9861, 9866, 9867, 9870-9874, 9891, 9895-9897, 9910, 9920, 9931	C000-C809	012
(c) Chronic myeloproliferative diseases	9863, 9875, 9876, 9950, 9960-9964	C000-C809	013
(d) Myelodysplastic syndrome and other myeloproliferative diseases	9945, 9946, 9975, 9980, 9982-9987, 9989	C000-C809	014
(e) Unspecified and other specified leukemias	9800, 9801, 9805, 9860, 9930	C000-C809	015
II Lymphomas and reticuloendothelial neoplasms			
(a) Hodgkin lymphomas	9650-9655, 9659, 9661-9665, 9667	C000-C809	021
(b) Non-Hodgkin lymphomas (except Burkitt lymphoma)	9591, 9670, 9671, 9673, 9675, 9678-9680, 9684, 9689-9691, 9695, 9698-9702, 9705, 9708, 9709, 9714, 9716-9719, 9727-9729, 9731-9734, 9760-9762, 9764-9769, 9970	C000-C809	022
(c) Burkitt lymphoma	9687	C000-C809	023
(d) Miscellaneous lymphoreticular neoplasms	9740-9742, 9750, 9754-9758	C000-C809	024
(e) Unspecified lymphomas	9590, 9596	C000-C809	025
III CNS and miscellaneous intracranial and intraspinal neoplasms			
(a) Ependymomas and choroid plexus tumor	9383, 9390-9394	C000-C809	031
(b) Astrocytomas	9380	C723	032
	9384, 9400-9411, 9420, 9421-9424, 9440-9442	C000-C809	032
(c) Intracranial and intraspinal embryonal tumors	9470-9474, 9480, 9508	C000-C809	033
	9501-9504	C700-C729	033
(d) Other gliomas	9380	C700-C722, C724-C729, C751, C753	034
	9381, 9382, 9430, 9444, 9450, 9451, 9460	C000-C809	034
(e) Other specified intracranial and intraspinal neoplasms	8270-8281, 8300, 9350-9352, 9360-9362, 9412, 9413, 9492, 9493, 9505-9507, 9530-9539, 9582	C000-C809	035
(f) Unspecified intracranial and intraspinal neoplasms	8000-8005	C700-C729, C751-C753	036

IV Neuroblastoma and other peripheral nervous cell tumors			
(a) Neuroblastoma and ganglioneuroblastoma	9490, 9500	C000-C809	041
(b) Other peripheral nervous cell tumors	8680-8683, 8690-8693, 8700, 9520-9523	C000-C809	042
	9501-9504	C000-C699, C739-C768, C809	042
V Retinoblastoma	9510-9514	C000-C809	050
VI Renal tumors			
(a) Nephroblastoma and other nonepithelial renal tumors	8959, 8960, 8964-8967	C000-C809	061
	8963, 9364	C649	061
(b) Renal carcinomas	8010-8041, 8050-8075, 8082, 8120-8122, 8130-8141, 8143, 8155, 8190-8201, 8210, 8211, 8221-8231, 8240, 8241, 8244-8246, 8260-8263, 8290, 8310, 8320, 8323, 8401, 8430, 8440, 8480-8490, 8504, 8510, 8550, 8560-8576	C649	062
	8311, 8312, 8316-8319, 8361	C000-C809	062
(c) Unspecified malignant renal tumors	8000-8005	C649	063
VII Hepatic tumors			
(a) Hepatoblastoma	8970	C000-C809	071
(b) Hepatic carcinomas	8010-8041, 8050-8075, 8082, 8120-8122, 8140, 8141, 8143, 8155, 8190-8201, 8210, 8211, 8230, 8231, 8240, 8241, 8244-8246, 8260-8264, 8310, 8320, 8323, 8401, 8430, 8440, 8480-8490, 8504, 8510, 8550, 8560-8576	C220, C221	072
	8160-8180	C000-C809	072
(c) Unspecified malignant hepatic tumors	8000-8005	C220, C221	073
VIII Malignant bone tumors			
(a) Osteosarcomas	9180-9187, 9191-9195, 9200	C400-C419, C760-C768, C809	081
(b) Chondrosarcomas	9210, 9220, 9240	C400-C419, C760-C768, C809	082
	9221, 9230, 9241-9243	C000-C809	082
(c) Ewing tumor and related sarcomas of bone	9260	C400-C419, C760-C768, C809	083
	9363-9365	C400-C419	083
(d) Other specified malignant bone tumors	8810, 8811, 8823, 8830	C400-C419	084
	8812, 9250, 9261, 9262, 9270-9275, 9280-9282, 9290, 9300-9302, 9310-9312, 9320-9322, 9330, 9340-9342, 9370-9372	C000-C809	084
(e) Unspecified malignant bone tumors	8000-8005, 8800, 8801, 8803-8805	C400-C419	085

IX Soft tissue and other extraosseous sarcomas			
(a)Rhabdomyosarcomas	8900-8905, 8910, 8912, 8920, 8991	C000-C809	091
(b) Fibrosarcomas, peripheral nerve sheath tumors, and other fibrous neoplasms	8810, 8811, 8813-8815, 8821, 8823, 8834-8835	C000-C399, C440-C768, C809	092
	8820, 8822, 8824-8827, 9150, 9160, 9491, 9540-9571, 9580	C000-C809	092
(c) Kaposi sarcoma	9140	C000-C809	093
(d) Other specified soft tissue sarcomas	8587, 8710-8713, 8806, 8831-8833, 8836, 8840-8842, 8850-8858, 8860-8862, 8870, 8880, 8881, 8890-8898, 8921, 8982, 8990, 9040-9044, 9120-9125, 9130-9133, 9135, 9136, 9141, 9142, 9161, 9170-9175, 9231, 9251, 9252, 9373, 9581	C000-C809	094
	8830	C000-C399, C440-C768, C809	094
	8963	C000-C639, C659-C699, C739-C768, C809	094
	9180, 9210, 9220, 9240	C490-C499	094
	9260	C000-C399, C470-C759	094
	9364	C000-C399, C470-C639, C659-C699, C739-C768, C809	094
	9365	C000-C399, C470-C639, C659-C768, C809	094
(e) Unspecified soft tissue sarcomas	8800-8805	C000-C399, C440-C768, C809	095
X Germ cell tumors, trophoblastic tumors, and neoplasms of gonads			
(a) Intracranial and intraspinal germ cell tumors	9060-9065, 9070-9072, 9080-9085, 9100, 9101	C700-C729, C751-C753	101
(b) Malignant extracranial and extragonadal germ cell tumors	9060-9065, 9070-9072, 9080-9085, 9100-9105	C000-C559, C570-C619, C630-C699, C739-C750, C754-C768, C809	102
(c) Malignant gonadal germ cell tumors	9060-9065, 9070-9073, 9080-9085, 9090, 9091, 9100, 9101	C569, C620-C629	103
(d) Gonadal carcinomas	8010-8041, 8050-8075, 8082, 8120-8122, 8130-8141, 8143, 8190-8201, 8210, 8211, 8221-8241, 8244-8246, 8260-8263, 8290, 8310, 8313, 8320, 8323, 8380-8384, 8430, 8440, 8480-8490, 8504, 8510, 8550, 8560-8573, 9000, 9014, 9015	C569, C620-C629	104
	8441-8444, 8450, 8451, 8460-8473	C000-C809	104
(e) Other and unspecified malignant gonadal tumors	8590-8671	C000-C809	105
	8000-8005	C569, C620-C629	105

XI Other malignant epithelial neoplasms and malignant melanomas			
(a) Adrenocortical carcinomas	8370-8375	C000-C809	111
(b) Thyroid carcinomas	8010-8041, 8050-8075, 8082, 8120-8122, 8130-8141, 8190, 8200, 8201, 8211, 8230, 8231, 8244-8246, 8260-8263, 8290, 8310, 8320, 8323, 8430, 8440, 8480, 8481, 8510, 8560-8573	C739	112
	8330-8337, 8340-8347, 8350	C000-C809	112
(c) Nasopharyngeal carcinomas	8010-8041, 8050-8075, 8082, 8083, 8120-8122, 8130-8141, 8190, 8200, 8201, 8211, 8230, 8231, 8244-8246, 8260-8263, 8290, 8310, 8320, 8323, 8430, 8440, 8480, 8481, 8500-8576	C110-C119	113
(d) Malignant melanomas	8720-8780, 8790	C000-C809	114
(e) Skin carcinomas	8010-8041, 8050-8075, 8078, 8082, 8090-8110, 8140, 8143, 8147, 8190, 8200, 8240, 8246, 8247, 8260, 8310, 8320, 8323, 8390-8420, 8430, 8480, 8542, 8560, 8570-8573, 8940, 8941	C440-C449	115
(f) Other and unspecified carcinomas	8010-8084, 8120-8157, 8190-8264, 8290, 8310, 8313-8315, 8320-8325, 8360, 8380-8384, 8430-8440, 8452-8454, 8480-8586, 8588-8589, 8940, 8941, 8983, 9000, 9010-9016, 9020, 9030	C000-C109, C129-C218, C239-C399, C480-C488, C500-C559, C570-C619, C630-C639, C659-C729, C750-C768, C809	116
XII Other and unspecified malignant neoplasms			
(a) Other specified malignant tumors	8930-8936, 8950, 8951, 8971-8981, 9050-9055, 9110	C000-C809	121
	9363	C000-C399, C470-C759	121
(b) Other unspecified malignant tumors	8000-8005	C000-C218, C239-C399, C420-C559, C570-C619, C630-C639, C659-C699, C739-C750, C754-C809	122
Not Classified by ICCC or in situ			999

1. Steliarova-Foucher E, Stiller C, Lacour B, Kaatsch P. International Classification of Childhood Cancer, Third Edition. *Cancer* 2005;103:1457-67.

APPENDIX 3.

CAUSES OF CHILDHOOD DEATH IN THE NORTHERN PLAINS STATES, 2001-2005
AND IN THE UNITED STATES, 2000-2005†

	Northern Plains States					United States				
	Age Groups					Age Groups				
	0-4	5-9	10-14	15-19	Total	0-4	5-9	10-14	15-17§	Total
Congenital malformations and conditions arising in the perinatal period	886 60%	36 18%	37 14%	23 2%	982 33%	52%	7%	5%	2%	47%
Sudden Infant Death Syndrome	133 9%	0	0	0	133 5%	8%				7%
Unintentional injury, suicide, and homicide	214 15%	98 50%	172 65%	764 78%	1,248 43%	6%	42%	50%	73%	12%
Cancer	16 1%	21 11%	19 7%	54 6%	110 4%	0.4%	17%	13%	6%	1%
All other causes	223 15%	41 21%	38 14%	142 14%	444 15%	34%	40%	32%	19%	33%
Total	1,472	196	266	983	2,917					

† http://205.207.175.93/hdaa/ReportFolders/ReportFolders.aspx?IF_ActivePathName=P/Mortality

§ US data are not available for the age group 15-19 years.

APPENDIX 4

CLASSIFICATION AND DISTRIBUTION OF CHILDHOOD CANCERS IN THE NORTHERN PLAINS STATES, 2001-2005 AND THE UNITED STATES, 2002-2004

Diagnostic Group	Northern Plains	United States
I. Leukemias, myeloproliferative diseases, and myelodysplastic disorders	24.9%	26.2%
II. Lymphomas and reticuloendothelial neoplasms	16.9%	14.3%
III. Central nervous system and miscellaneous intracranial and intraspinal neoplasms	18.7%	17.7%
IV. Neuroblastoma and other peripheral nervous cell tumors	3.8%	4.9%
V. Retinoblastoma	1.1%	1.7%
VI. Renal tumors	3.8%	3.8%
VII. Hepatic tumors	0.1%	1.3%
VIII. Malignant bone tumors	5.8%	5.3%
IX. Soft tissue and other extraosseous sarcomas	7.0%	7.1%
X. Germ cell tumors, trophoblastic tumors, and neoplasms of the gonads	6.6%	6.5%
XI. Other malignant epithelial neoplasms and malignant melanomas	10.3%	10.4%
XII. Other and unspecified malignant neoplasms	1.0%	0.7%
TOTAL	100%	100%

Diagnostic Group	Northern Plains				United States			
	Age Groups				Age Groups			
	0-4	5-9	10-14	15-19	0-4§	5-9	10-14	15-19
I. Leukemias, myeloproliferative diseases, and myelodysplastic disorders	35.4%	32.3%	20.5%	16.2%		34.4%	22.2%	14.3%
II. Lymphomas and reticuloendothelial neoplasms	4.9%	13.3%	21.2%	23.6%		11.9%	18.4%	22.9%
III. Central nervous system and miscellaneous intracranial and intraspinal neoplasms	20.3%	29.5%	22.4%	11.1%		28.9%	19.7%	10.1%
IV. Neuroblastoma and other peripheral nervous cell tumors	12.3%	2.9%	1.0%	0.4%		2.9%	1.0%	0.4%
V. Retinoblastoma	4.3%	0	0	0		0.4%	-	-
VI. Rental tumors	10.0%	7.6%	0	0.4%		4.3%	1.0%	0.6%
VII. Hepatic tumors	1.2%	0	1.5%	0		0.5%	1.0%	0.6%
VIII. Malignant bone tumors	1.2%	2.9%	6.1%	9.8%		4.5%	10.5%	7.0%
IX. Soft tissue and other extraosseous sarcomas	8.0%	4.8%	12.9%	4.4%		6.9%	9.3%	7.4%
X. Germ cell tumors, trophoblastic tumors, and neoplasms of the gonads	1.8%	1.9%	6.1%	11.9%		1/9%	5.8%	13.0%
XI. Other malignant epithelial neoplasms and malignant melanomas	0	3.8%	8.3%	20.6%		3.4%	10.7%	23.1%
XII. Other and unspecified malignant neoplasms	0.6%	1.0%	0	1.6%		0.3%	0.4%	0.6%
TOTAL	100%	100%	100%	100%		100%	100%	100%

§ US data are not available for the age group 0-4 years.

APPENDIX 5

THE 2000 UNITED STATES STANDARD MILLION POPULATION

Age Group, years	Population
0-4	69,135
5-9	72,533
10-15	73,032
15-19	72,169
20-24	66,478
25-29	64,529
30-34	71,044
35-39	80,762
40-44	81,851
45-49	72,118
50-54	62,716
55-59	48,458
60-64	38,793
65-69	34,264
70-74	31,773
75-79	26,999
80-84	17,842
85+	15,508
TOTAL	1,000,000

SEER Program, National Cancer Institute, 2003

APPENDIX 6

STATE POPULATIONS, 2001-2005

Age Group, years	Montana†	North Dakota‡	South Dakota§	Wyoming†	TOTAL
0-4	273,210	183,145	256,405	154,158	866,918
5-9	284,287	193,661	258,145	154,020	890,113
10-14	324,751	215,031	286,200	174,522	1,000,504
15-19	350,648	245,513	300,725	199,758	1,096,644

† State population estimate based on sum of mid-year intercensal estimates from 2001, 2002, 2003, 2004, and 2005.

‡ State population estimate based on 2000 Census count times 5.

§ State population estimate based on mid-year intercensal estimate from 2003 times 5.

Appendix 7

DATA TABLES

CHILDHOOD CANCER INCIDENCE AND MORTALITY IN THE NORTHERN PLAINS STATES, 2001-2005

Estimated incidence and mortality rates for the Northern Plains states based on fewer than five cases are flagged with a caret (^). Estimated rates based on small numbers of cases may be unstable and should be interpreted with caution and with special attention to the accompanying Confidence Intervals.

Incidence and mortality rates for the United States are for 2002-2004, from Centers for Disease Control and Prevention's United States Cancer Statistics website, http://apps.nccd.cdcd.gov/uscs/ National data are not available for the 0-4 year age group. National data are not reported if rates are based on fewer than 16 cases in a cell. The symbol ~ indicates national data are not available.

ALL SITES

Age-Adjusted Incidence, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
Males	19.1 (15.69 - 22.53)	21.5 (17.10 - 25.88)	15.3 (12.12 - 18.54)	16.3 (12.01 - 20.49)	18.0 (14.70 - 21.32)	-
Females	17.0 (13.70 - 20.26)	16.6 (12.66 - 20.47)	12.2 (9.24 - 15.08)	15.7 (11.46 - 19.97)	15.3 (12.17 - 18.38)	-
Both sexes	18.1 (15.70 - 20.44)	19.1 (16.15 - 22.05)	13.8 (11.61 - 15.96)	16.0 (12.99 - 19.00)	16.7 (14.40 - 18.95)	16.7 (16.52 - 16.86)

Age-Adjusted Mortality, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
Males	2.4 (1.16 - 3.56)	3.3 (1.55 - 4.99)	3.4 (1.93 - 4.96)	1.9 (0.48 - 3.29)	2.8 (1.48 - 4.06)	-
Females	2.5 (1.22 - 3.74)	1.5 (0.29 - 2.67)	1.9 (0.71 - 3.03)	2.7 (0.91 - 4.40)	2.1 (0.95 - 3.28)	-
Both sexes	2.4 (1.55 - 3.28)	2.4 (1.34 - 3.46)	2.7 (1.72 - 3.64)	2.3 (1.15 - 3.37)	2.5 (1.58 - 3.32)	2.8 (2.7 - 2.8)

Age-Specific Incidence, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
0 - 4 years	22.0 (16.40 - 27.52)	19.7 (13.24 - 26.08)	12.9^ (8.48 - 17.26)	22.1 (14.64 - 29.47)	18.8 (15.92 - 21.69)	-
5 - 9 years	12.7 (8.53 - 16.80)	13.9 (8.68 - 19.20)	8.9 (5.27 - 12.55)	12.3 (6.79 - 17.88)	11.8 (9.54 - 14.05)	11.5 (11.24 - 11.81)
10-14 years	14.8 (10.60 - 18.96)	17.2 (11.66 - 22.75)	9.8 (6.16 - 13.41)	10.9 (5.99 - 15.78)	13.2 (10.94 - 15.44)	12.7 (12.42 - 12.99
15-19 years	23.1 (18.07 - 28.13)	25.7 (19.32 - 32.00)	23.6 (18.12 - 29.10)	19.0 (12.97 - 25.07)	23.1 (20.23 - 25.91)	21.2 (20.85-21.60)

Age-Specific Mortality, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
0 - 4 years	1.8 (0.23 - 3.43)	2.7 (0.34 - 5.12)	1.6^ (0.03 - 3.09)	0.6^ (0 - 1.92)	1.7 (0.85 - 2.61)	-
5 - 9 years	3.2 (1.10 - 5.23)	2.1^ (0.04 - 4.09)	2.7 (0.70 - 4.72)	1.9^ (0 - 4.15)	2.6 (1.53 - 3.64)	2.7 (2.5 - 2.8)
10-14 years	1.2^ (0.02 - 2.44)	2.8 (0.56 - 5.02)	2.1 (0.42 - 3.77)	2.9 (0.35 - 5.38)	2.1 (1.20 - 3.00)	2.5 (2.4 - 2.6)
15-19 years	3.4 (1.49 - 5.36)	2.0 (0.25 - 3.82)	4.3 (1.97 - 6.67)	3.5 (0.91 - 6.10)	3.4 (2.29 - 4.46)	3.5 (3.3 - 3.6)

I. LEUKEMIAS, MYELOPROLIFERATIVE DISEASES, AND MYELODYSPLASTIC DISEASES

Total

Age-Adjusted Incidence and Mortality, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
Incidence	4.8 (3.54 - 6.01)	4.9 (3.40 - 6.43)	4.0 (2.83 - 5.20)	2.6 (1.37 - 3.86)	4.2 (3.05 - 5.36)	4.4 (4.29 - 4.46)
Mortality	0.3^ (0 - 0.64)	0.5^ (0.01 - 0.93)	0.6 (0.16 - 1.06)	0.6^ (0.01 - 1.15)	0.5 (0.10 - 0.86)	0.8 (0.8 - 0.9)

Age-Specific Incidence, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
0 - 4 years	8.1 (4.69 - 11.42)	6.6 (2.84 - 10.26)	6.2 (3.18 - 9.30)	5.2 (1.59 - 8.79)	6.7 (4.97 - 8.41)	~
5 - 9 years	3.2 (1.10 - 5.23)	4.6 (1.61 - 7.68)	3.9 (1.47 - 6.27)	3.9 (0.78 - 7.01)	3.8 (2.54 - 5.10)	3.9 (3.76 - 3.49)
10-14 years	4.6 (2.28 - 6.96)	3.3 (0.84 - 5.67)	1.7 (0.22 - 3.28)	0	2.7 (1.68 - 3.72)	2.8 (2.70 - 2.97)
15-19 years	3.4 (1.49 - 5.36)	5.3 (2.42 - 8.17)	4.3 (1.97 - 6.67)	1.5^ (0 - 3.20)	3.7 (2.59 - 4.88)	3.0 (2.89 - 3.18)

Age-Specific Mortality, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
0 - 4 years	0.4^ (0 - 1.08)	1.1^ (0 - 2.61)	0	0	0.3^ (0 - 0.74)	~
5 - 9 years	0.4^ (0 - 1.04)	0	0.4^ (0 - 1.15)	0.6^ (0 - 1.92)	0.3^ (0 - 0.72)	0.8 (0.7 - 0.8)
10-14 years	0	0	0.7^ (0 - 1.67)	1.1^ (0 - 2.73)	0.4^ (0.01 - 0.79)	0.8 (0.7 - 0.9)
15-19 years	0.6^ (0 - 1.36)	0.8^ (0 - 1.94)	1.3^ (0.03 - 2.63)	0.5^ (0 - 1.48)	0.8 (0.28 - 1.36)	1.0 (0.9 - 1.1)

Acute Lymphoblastic Leukemia

Age-Adjusted Incidence and Mortality, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
Incidence	3.1 (2.10 - 4.11)	4.2 (2.79 - 5.58)	2.7 (1.69 - 3.63)	2.2 (1.03 - 3.31)	3.3 (2.29 - 4.37)	3.1 (3.06 - 3.20)
Mortality	0.3 (0 - 0.53)	0	0.3^ (0 - 0.55)	0.3^ (0 - 0.70)	0.1 (0 - 0.35)	0.4 (0.4 - 0.4)

Acute Myeloid Leukemia

Age-Adjusted Incidence and Mortality, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
Incidence	0.7 (0.25 - 1.19)	0.5^ (0.01 - 0.98)	0.8 (0.29 - 1.37)	0.5^ (0 - 0.95)	0.7 (0.20 - 1.12)	0.8 (0.76 - 0.84)
Mortality	0.1 (0 - 0.21)	0	0.2^ (0 - 0.43)	0.3^ (0 - 0.70)	0.1^ (0 - 0.28)	0.3 (0.2 - 0.3)

II. LYMPHOMAS AND RETICULOENDOTHELIAL NEOPLASMS

Age-Adjusted Incidence and Mortality, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
Incidence	2.4 (1.55 - 3.24)	2.7 (1.56 - 3.74)	2.7 (1/74 - 3/64)	3.4 (2.06 - 4.74)	2.7 (1.81 - 3.61)	2.4 (2.33 - 2.45)
Mortality	0.2^ (0 - 0.40)	0.1^ (0 - 0.30)	0.2^ (0 - 0.41)	0.2^ (0 - 0.43)	0.2 (0 - 0.36)	~

Age-Specific Incidence, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
0 - 4 years	1.1^ (0 - 2.34)	1.6^ (0 - 3.49)	0.8^ (0 - 1.86)	0	0.9 (0.28 - 1.56)	~
5 - 9 years	1.1^ (0 - 2.25)	2.6 (0.32 - 4.84)	1.2^ (0 - 2.48)	1.9^ (0 - 4.15)	1.6 (0.75 - 2.40)	1.4 (1.28 - 1.47)
10-14 years	3.1 (1.17 - 4.99)	1.9^ (0.04 - 3.68)	2.4 (0.63 - 4.26)	4.0 (1.04 - 6.98)	2,8 (1.76 - 3.84)	2.3 (2.22 - 2.47)
15-19 years	4.3 (2.11 - 6.44)	4.5 (1.83 - 7.13)	6.3 (3.48 - 9.16)	7.5 (3.71 - 11.31)	5,5 (4.09 - 6.86)	4.8 (4.66 - 5.03)

Age-Specific Mortality, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
0 - 4 years	0.4^ (0 - 1.08)	0	0	0	0.1^ (0 - 0.34)	~
5 - 9 years	0	0	0	0	0	~
10-14 years	0.3^ (0 - 0.91)	0	0.3^ (0 - 1.03)	0.6^ (0 - 1.70)	0.3^ (0 - 0.64)	~
15-19 years	0	0.4^ (0 - 1.21)	0.3^ (0 - 0.98)	0	0.2^ (0 - 0.44)	~

III. BRAIN, CENTRAL NERVOUS SYSTEM, AND INTRACRANIAL AND INTRASPINAL NEOPLASMS†

Age-Adjusted Incidence and Mortality, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
Incidence	3.0 (2.02 - 3.98)	4.4 (2.92 - 5.78)	2.4 (1.51 - 3.35)	3.5 (2.05 - 4.91)	3,2 (2.19 - 4.21)	3.0 (2.89 - 3.04)
Mortality	0.8 (0.32 - 1.36)	1.3 (0.48 - 2.04)	0.7^ (0.05 - 0.85)	0.6^ (0.01 - 1.21)	0.9 (0.33 - 1.38)	0.7 (0.7 - 0.7)

Age-Specific Incidence, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
0 - 4 years	4.8 (2.17 - 7.34)	3.8 (0.99 - 6.65)	1.6^ (0.03 - 3.09)	5.8 (2.02 - 9.65)	3.8 (2.51 - 5.11)	~
5 - 9 years	3.2 (1.10 - 5.23)	5.2 (1.96 - 8.36)	2.3 (0.46 - 4.18)	3.9 (0.78 - 7.01)	3.5 (2.26 - 4.71)	3.3 (3.18 - 3.49)
10-14 years	2.2 (0.56 - 3.75)	5.1 (2.09 - 8.14)	2.8 (0.86 - 4.73)	2.3^ (0.05 - 4.54)	3.0 (1.93 - 4.07)	2.5 (2.37 - 2.63)
15-19 years	2.0 (0.52 - 3.48)	3.3 (1.00 - 5.52)	3.0 (1.04 - 4.95)	2.0^ (0.04 - 3.96)	2.6 (1.61 - 3.50)	2.2 (2.03 - 2.27)

Age-Specific Mortality, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
0 - 4 years	0.4^ (0 - 1.08)	1.6^ (0 - 3.49)	0.4^ (0 - 1.15)	0.6^ (0 - 1.92)	0.7 (0.14 - 1.25)	~
5 - 9 years	2.1 (0.42 - 3.80)	1.5^ (0 - 3.30)	1.2^ (0 - 2.48)	1.3^ (0 - 3.10)	1.6 (0.75 - 2.40)	0.9 (0.9 - 1.0)
10-14 years	0	1.9^ (0.04 - 3.68)	0.7^ (0 - 1.67)	0	0.6 (0.12 - 1.08)	0.7 (0.6 - 0.8)
15-19 years	0.9^ (0 - 1.82)	0	0.7^ (0 - 1.59)	0.5^ (0 - 1.48)	0.5 (0.11 - 0.98)	0.5 (0.5 - 0.6)

† Excludes benign brain tumors.

IV. NEUROBLASTOMA AND OTHER PERIPHERAL NERVOUS CELL TUMORS

Age-Adjusted Incidence and Mortality, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
Incidence	0.9 (0.34 - 1.43)	0.9 (0.23 - 1.53)	0.4^ (0.01 - 0.75)	0.6^ (0.01 - 1.25)	0.7 (0.21 - 1.17)	0.8 (0.77 - 0.85)
Mortality	0.1^ (0 - 0.26)	0	0.2^ (0 - 0.43)	0.2^ (0 - 0.49)	0.1^ (0 - 0.30)	~

Age-Specific Incidence, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
0 - 4 years	3.3 (1.14 - 5.45)	2.7 (0.34 - 5.12)	1.2^ (0 - 2.49)	1.9^ (0 - 4.15)	2.3 (1.30 - 3.32)	~
5 - 9 years	0.4^ (0 - 1.04)	0	0.4^ (0 - 1.1.5)	0.6^ (0 - 1.92)	0.3^ (0 - 0.72)	0.3 (0.28 - 0.38)
10-14 years	0	0.5^ (0 - 1.38)	0	0	0.1^ (0 - 0.30)	0.1 (0.10 - 0.16)
15-19 years	0	0.4^ (0 - 1.21)	0	0	0.1^ (0 - 0.27)	0.08 (0.05 - 0.10)

Age-Specific Mortality, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
0 - 4 years	0	0	0	0	0	~
5 - 9 years	0.4^ (0 - 1.04)	0	0.4^ (0 - 1.15)	0.6^ (0 - 1.92)	0.3^ (0 - 0.72)	~
10-14 years	0	0	0	0	0	~
15-19 years	0	0	0.3^ (0 - 0.98)	0	0.1^ (0 - 0.27)	~

V. RETINOBLASTOMA

Age-Adjusted Incidence and Mortality, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
Incidence	0.3^ (0 - 0.56)	0.1^ (0 - 0.39)	0.2^ (0 - 0.45)	0.2^ (0 - 0.46)	0.2 (0 - 0.45)	0.3 (0.27 - 0.32)
Mortality	0	0	0	0.2^ (0 - 0.46)	0.03^ (0 - 0.12)	~

Age-Specific Incidence, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
0 - 4 years	1.1^ (0 - 2.34)	0.5^ (0 - 1.62)	0.8^ (0 - 1.86)	0.6^ (0 - 1.92)	0.8 (0.21 - 1.41)	~
5 - 9 years	0	0	0	0	0	0.04 (0.02 - 0.06)
10-14 years	0	0	0	0	0	~
15-19 years	0	0	0	0	0	~

Age-Specific Mortality, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
0 - 4 years	0	0	0	0.7^ (0 - 1.92)	0.1 (0 - 0.33)	~
5 - 9 years	0	0	0	0	0)	~
10-14 years	0	0	0	0	0	~
15-19 years	0	0	0	0	0	~

VI. RENAL TUMORS

Age-Adjusted Incidence and Mortality, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
Incidence	1.0 (0.40 - 1.55)	0.7 (0.08 - 1.23)	0.3^ (0 - 0.58)	1.0 (0.19 - 1.70)	0.7 (0.21 - 1.18)	0.6 (0.61 - 0.67)
Mortality	0	0.2^ (0 - 0.56)	0.2^ (0 - 0.46)	0.2^ (0 - 0.43)	0.1 (0 - 0.34)	0.1 (0.1 - 0.1)

Age-Specific Incidence, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
0 - 4 years	1.8 (0.23 - 3.43)	2.2^ (0.04 - 4.32)	0.8^ (0 - 1.86)	3.2 (0.40 - 6.09)	1.8 (0.94 - 2.75)	~
5 - 9 years	2.1 (0.42 - 3.80)	0.5^ (0 - 1.53)	0	0.6^ (0 - 1.92)	0.9 (0.28 - 1.52)	0.5 (0.43 - 0.55)
10-14 years	0	0	0	0	0	0.1 (0.10 - 0.16)
15-19 years	0	0	0.3^ (0 - 0.98)	0	0.1^ (0 - 0.27)	0.1 (0.10 - 0.16)

Age-Specific Mortality, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
0 - 4 years	0	0	0.4^ (0 - 1.15)	0	0.1^ (0 - 0.34)	~
5 - 9 years	0	0.5^ (0 - 1.53)	0.4^ (0 - 1.15)	0	0.2^ (0 - 0.54)	0.1 (0.1 - 0.2)
10-14 years	0	0	0	0.6^ (0 - 1.70)	0.1^ (0 - 0.30)	0
15-19 years	0	0.4^ (9 - 1.21)	0	0	0.1^ (0 - 0.27)	0

VII. HEPATIC TUMORS

Age-Adjusted Incidence and Mortality, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
Incidence	0.2^ (0 - 0.40)	0	0.2^ (0 - 0.44)	0	0.1^ (0 - 0.29)	0.2 (0.19 - 0.23)
Mortality	0.2^ (0 - 0.36)	0	0.1^ (0 - 0.26)	0	0.1^ (0 - 0.22)	~

Age-Specific Incidence, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
0 - 4 years	0.4^ (0 - 1.08)	0	0.4^ (0 - 1.15)	0	0.2^ (0 - 0.55)	~
5 - 9 years	0	0	0	0	0	0.06 (0.04 - 0.08)
10-14 years	0.3^ (0 - 0.91)	0	0.3^ (0 - 1.03)	0	0.2^ (0 - 0.48)	0.07 (0.05 - 0.10)
15-19 years	0	0	0	0	0	0.1 (0.10 - 0.16)

Age-Specific Mortality, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
0 - 4 years	0	0	0	0	0	~
5 - 9 years	0	0	0	0	0	~
10-14 years	0.3^ (0 - 0.91)	0	0.3^ (0 - 1.03)	0	0.2^ (0 - 0.48)	~
15-19 years	0.3^ (0 - 0.84)	0	0	0	0.1^ (0 - 0.27)	~

VIII. MALIGNANT BONE TUMORS

Age-Adjusted Incidence and Mortality, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
Incidence	1.2 (0.61 - 1.78)	0.9 (0.26 - 1.47)	07 (0.21 - 1.18)	0.9 (0.17 - 1.52)	0.9 (0.40 - 1.43)	0.9 (0.84 - 0.92)
Mortality	0.4 (0.04 - 0.69)	0	0.4^ (0.01 - 0.69)	0.5^ (0.01 - 1.04)	0.3 (0.01 - 0.61)	0.2 (0.2 - 0.2)

Age-Specific Incidence, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
0 - 4 years	0	0.5^ (0 - 1.62)	0	0.6^ (0 - 1.92)	0.2^ (0 - 0.55)	~
5 - 9 years	0.4^ (0 - 1.04)	0	0.8^ (0 - 1.85)	0	0.3^ (0 - 0.72)	0.5 (0.46 - 0.59)
10-14 years	1.2^ (0.02 - 2.44)	0.5^ (0 - 1.38)	0	1.7^ (0 - 3.66)	0.8 (0.25 - 1.35)	1.3 (1.24 - 1.43)
15-19 years	3.1 (1.28 - 4.99)	2.4 (0.49 - 4.40)	2.0^ (0.40 - 3.59)	1.0^ (0 - 2.39)	2.3 (1.39 - 3.17)	1.5 (1.38 - 1.58)

Age-Specific Mortality, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
0 - 4 years	0	0	0	0	0	~
5 - 9 years	0	0	0.4^ (0 - 1.15)	0	0.1^ (0 - 0.33)	0.1 (0.1 - 0.1)
10-14 years	0.3^ (0 - 0.91)	0	0	0.6^ (0 - 1.70)	0.2^ (0 - 0.48)	0.3 (0.2 - 0.3)
15-19 years	1.1^ (0.02 - 2.26)	0	1.0^ (0 - 2.13)	1.5^ (0 - 3.20)	0.9 (0.35 - 1.48)	0.5 (0.5 - 0.6)

IX. SOFT TISSUE AND OTHER EXTRAOSSEOUS SARCOMAS

Age-Adjusted Incidence and Mortality, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
Incidence	0.9 (0.37 - 1.43)	1.9 (0.97 - 2.83)	0.6 (0.16 - 1.10)	1.8 (0.75 - 2.74)	1.2 (0.58 - 1.80)	1.2 (1.14 - 1.23)
Mortality	0.3^ (0 - 0.54)	0.2^ (0 - 0.53)	0.1^ (0 - 0.28)	0	0.2 (0 - 0.38)	0.2 (0.2 - 0.2)

Age-Specific Incidence, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
0 - 4 years	1.5^ (0.03 - 2.90)	1.6^ (0 - 3.49)	0.8^ (0 - 1.86)	2.6^ (0.05 - 5.14)	1.5 (0.68 - 2.31)	
5 - 9 years	0.4^ (0 - 1.04)	0.5^ (0 - 1.53)	0.4^ (0 - 1.15)	1.3^ (0 - 3.10)	0.6 (0.07 - 1.05)	0.8 (0.72 - 0.87)
10-14 years	1.2^ (0.02 - 2.44)	4.2 (1.45 - 6.92)	0.7^ (0 - 1.67)	1.1^ (0 - 2.73)	1.7 (0.89 - 2.51)	1.2 (1.09 - 1.27)
15-19 years	0.6^ (0 - 1.36)	1.2^ (0 - 2.60)	0.7^ (0 - 1.59)	2.0^ (0.04 - 3.96)	1.0 (0.41 - 1.60)	1.6 (1.46 - 1.67)

Age-Specific Mortality, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
0 - 4 years	0.7^ (0 - 1.75)	0	0.4^ (0 - 01.5)	0	0.3^ (0 - 0.74)	-
5 - 9 years	0	0	0	0	0	0.1 (0.1 - 0.2)
10-14 years	0.3^ (0 - 0.91)	0.5^ (0 - 1.38)	0	0	0.2^ (0 - 0.48)	0.2 (0.2 - 0.2)
15-19 years	0	0.4^ (0 - 1.21)	0	0	0.1^ (0 - 0.27)	0.3 (0.3 - 0.4)

X. GERM CELL TUMORS, TROHPOBLASTIC TUMORS, AND NEOPLASMS OF THE GONADS

Age-Adjusted Incidence and Mortality, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
Incidence	1.0 (0.45 - 1.52)	0.9 (0.26 - 1.44)	1.3 (0.63 - 1.91)	1.0 (0.25 - 1.73)	1.0 (0.49 - 1.58)	1.1 (1.05 - 1.14)
Mortality	0	0	0.1^ (0 - 0.25)	0.8 (0.09 - 1.2)	0.2 (0 - 0.38)	~

Age-Specific Incidence, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
0 - 4 years	0	0	0	1.9^ (0 - 4.15)	0.3^ (0 - 0.74)	
5 - 9 years	0.7^ (0 - 1.68)	0	0	0	0.2^ (0 - 0.54)	0.2 (0.18 - 0.26)
10-14 years	0.6^ (0 - 1.47)	0.9^ (0 - 2.22)	1.0^ (0 - 2.23)	0.6^ (0 - 1.70)	0.8 (0.25 - 1.35)	0.7 (0.67 - 0.81)
15-19 years	2.6 (0.89 - 4.24)	2.4 (0.49 - 4.40)	4.0 (1.73 - 6.25))	1.5^ (0 - 3.20)	2.7 (1.76 - 3.71)	2.8 (2.62 - 2.89)

Age-Specific Mortality, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
0 - 4 years	0	0	0	0.7^ (0 - 1.92)	0.1^ (0 - 0.34)	~
5 - 9 years	0	0	0	1.3^ (0 - 3.10)	0.2^ (0 - 0.54)	~
10-14 years	0	0	0	0.6^ (0 - 1.70)	0.1^ (0 - 0.30)	~
15-19 years	0	0	0.3^ (0 - 0.98)	0.5^ (0 - 1.48)	0.2^ (0 - 0.44)	~

XI. OTHER MALIGNANT EPITHELIAL NEOPLASMS AND MALIGNANT MELANOMAS

Age-Adjusted Incidence and Mortality, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
Incidence	2.3 (1.49 - 3.12)	1.9 (1.02 - 2.79)	0.8 (0.26 - 1.26)	1.2 (0.41 - 1.94)	1.6 (0.91 - 2.26)	1.7 (1.69 - 1.80)
Mortality	0.1^ (0 - 0.34)	0	0	0	0.1^ (0 - 0.16)	

Age-Specific Incidence, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
0 - 4 years	0	0	0	0	0	
5 - 9 years	1.1^ (0 - 2.25)	0.5^ (0 - 1.53)	0	0	0.4^ (0.01 - 0.89)	0.4 (0.34 - 0.44)
10-14 years	1.5 (0.19 - 2.89)	0.9^ (0 - 2.22)	0.7^ (0 - 1.67)	1.2^ (0 - 2.73)	1.1 (0.45 - 1.75)	1.4 (1.27 - 1.46)
15-19 years	6.6 (3.88 - 9.24)	6.1 (3.02 - 9.20)	2.3 (0.60 - 4.05)	3.5 (0.91 - 6.10)	4.7 (3.45 -6.03)	4.9 (4.73 - 5.10)

Age-Specific Mortality, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
0 - 4 years	0	0	0	0	0	~
5 - 9 years	0	0	0	0	0	~
10-14 years	0	0	0	0	0	~
15-19 years	0.6^ (0 - 1.36)	0	0	0	0.2^ (0 - 0.44)	~

XII. OTHER AND UNSPECIFIED MALIGNANT NEOPLASMS

Age-Adjusted Incidence and Mortality, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
Incidence	0.2 (0 - 0.50)	0	1.5 (0.77 - 2.18)	0	0.1 (0 - 0.36)	0.1 (0.06 - 0.09)
Mortality	0.1 (0 - 0.26)	0.1^ (0 - 0.35)	0.2^ (0 - 0.42)	0.3^ (0 - 0.60)	0.2 (0 - 0.36)	~

Age-Specific Incidence, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
0 - 4 years	0	0	1.2^ (0 - 2.49)	0	0.1^ (0 - 0.34)	~
5 - 9 years	0.4^ (0 - 1.04)	0	0	0	0.1^ (0 - 0.33)	~
10-14 years	0	0	1.4^ (0.03 - 2.77)	0	0	0.05 (0.04-0.07)
15-19 years	0.6^ (0 - 1.36)	0	3.3 (1.26 - 5.39)	0	0.4^ (0.01 - 0.72)	0.1 (0.10-0.16)

Age-Specific Mortality, per 100,000

	Montana	North Dakota	South Dakota	Wyoming	Four States	United States
0 - 4 years	0	0	0.4^ (0 - 1.1.5)	0	0.1^ (0 - 0.34)	~
5 - 9 years	0.4^ (0 - 1.04)	0	0	0	0.1^ (0 - 0.33)	~
10-14 years	0	0.5^ (0 - 1.38)	0	0	0.1^ (0 - 0.30)	~
15-19 years	0	0	0.3^ (0 - 0.98)	1.0^ (0 - 2.39)	0.3^ (0 - 0.58)	~

APPENDIX 8

DATA SOURCES

For a detailed review of childhood cancer, suitable for general audiences, please see

Ries LAG, Smith, MA, Gurney, JG, Linet M, Tamra T, Young JL, and Bunin GR (eds). *Cancer Incidence and Survival Among Children and Adolescents: United States SEER Program 1975 - 1995.*
National Cancer Institute, SEER Program. NIH Pub. No. 99-4649. Bethedsa, MD. 1999.
Available on line at http://seer.cancer.gov/publications/childhood/

For a more technical treatment of childhood cancer, please see

Ross JA, Spector LG. Cancers in Children. In: Schottenfeld D, Fraumeni JR, Jr. (eds). *Cancer: Epidemiology and Prevention, 3rd Edition.*
New York: Oxford University Press, 2006. pp. 1251-1268.

For information about the Childhood Cancer Survivor Study, please visit the study website

http://www.stjude.org/stjude/v/index.jsp?gnextoid=2c1325ca7e88311VgnVCM1000001e0215acRCRD

For information about resources for childhood cancer survivors, please see

Establishing and Enhancing Services for Childhood Cancer Survivors: Long-Term Follow-Up Program Resource Guide.
Children's Oncology Group Nursing Discipline Clinical Practice Subcommittee on Survivorship in collaboration with the Late Effects Committee, 2007.
Copies of the document can be downloaded from
http://www.childrensoncologygroup.org or http://www.survivorshipguidelines.org

For comprehensive statistics about cancer in the United States, please see

United States Cancer Statistics. 1999-2004 Incidence and Mortality Web-Based Report.
US Cancer Statistics Working Group. Atlanta: US Department of Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute, 2007.
Available on line at http://www.cdc.gov.uscs

The National Cancer Institute maintains an interactive webpage where you may obtain cancer statistics, including reports from the Surveillance, Epidemiology, and End Results (SEER) Program: http://www.cancer.gov/statistics/

For additional information about cancer in the Northern Plains states, please visit the individual state cancer websites listed on the title page of this document.

Alternative accessible formats of this publication will be provided on request. Please contact one of the state tumor registries listed on the title page for more information.

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